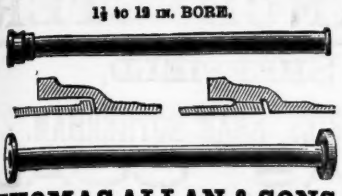
THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

VOL. LXIII. No. 1606.] LONDON, FEBRUARY 20, 1894. [46TH YEAR. PRICE 6d.

GAS AND WATER PIPES

1¼ to 12 IN. BORE.



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Consumes 3¾ cubic feet per hour.

Gives a light of 70 to 80 candle power.

Brilliant Light.

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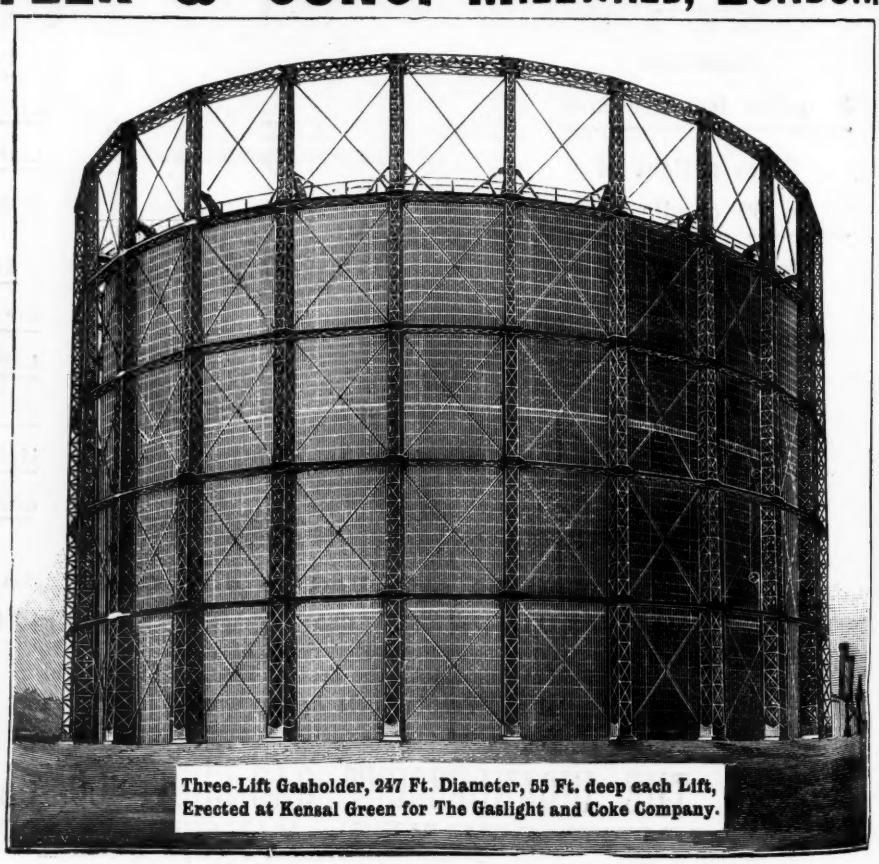

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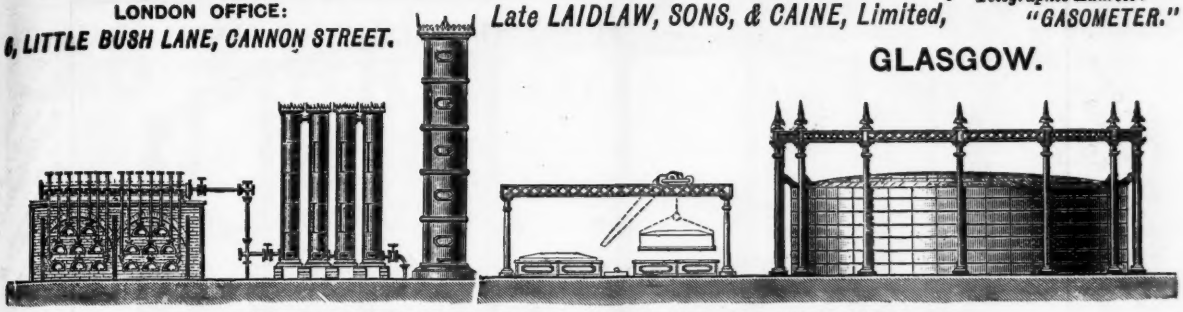

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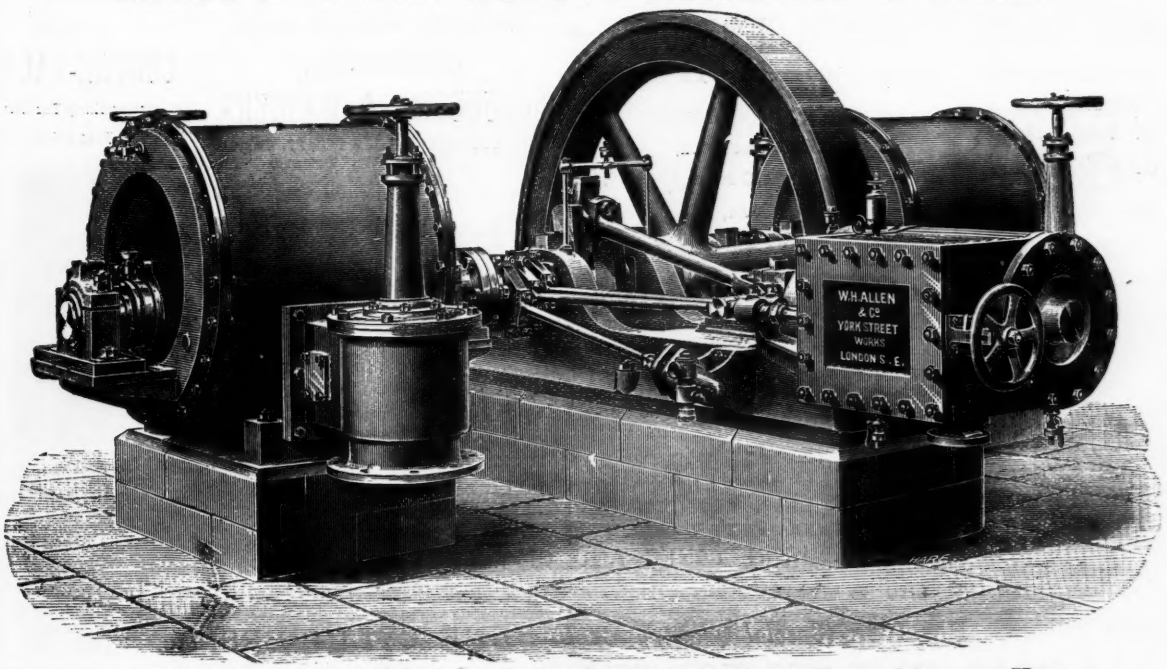

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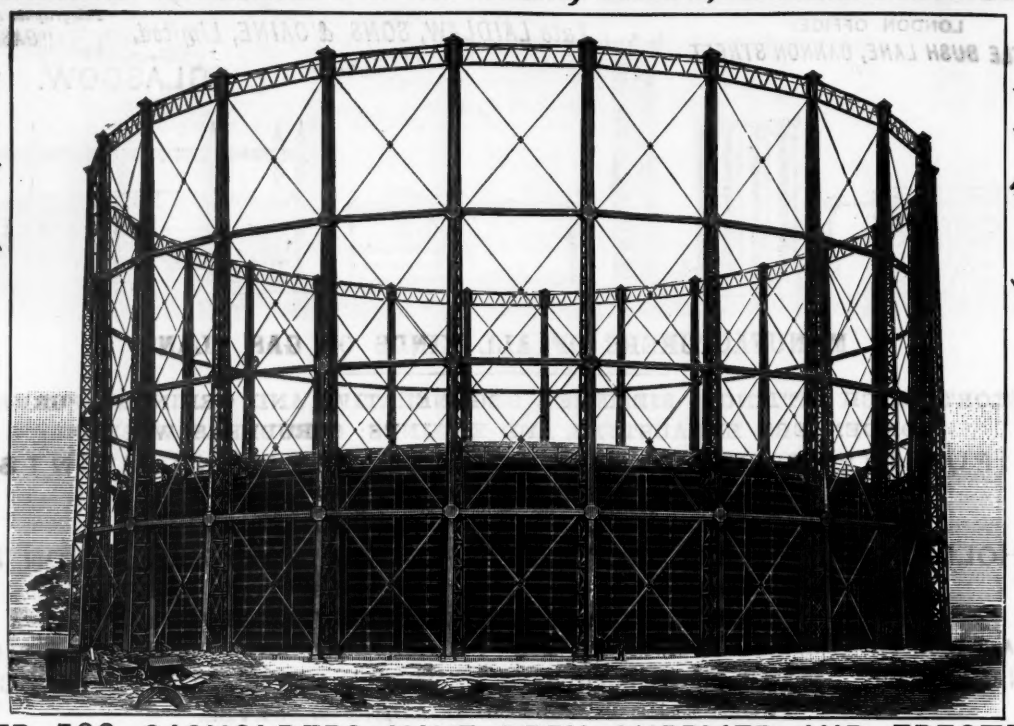

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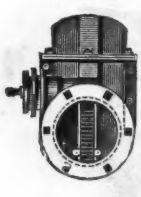

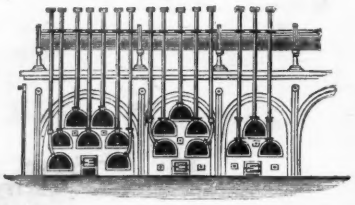

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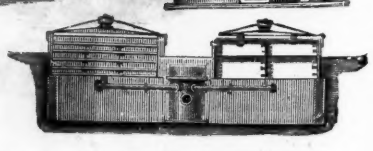

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PATENT STOP-COCK WITH LOCKING ARRANGEMENT

Opinion of

THOS. NEWBIGGING, Esq., M.Inst.C.E.,

5, Norfolk Street, Manchester, Oct. 9, 1893.

Messrs. WORMALD BROS., Eccles, Manchester.

Gentlemen,—I have examined the STOP-COCK (for gas and water), with your PATENT LOCKING ARRANGEMENT, and think very highly of it. It is simple, efficient, and inexpensive, not liable to get out of order, or to be tampered with. In all cases of temporary discontinuance of the supply of gas from any cause, the use of the Patent Locking Arrangement would be of great advantage, in saving the annoyance and expense, as well as the danger of leakage, in disconnecting the meter from the service-pipe. I should anticipate a large demand for the Stop-Cock, when its obvious merits are brought under the notice of those concerned.

I am, yours truly,
THOS. NEWBIGGING, M.Inst.C.E.

Opinion of

J. HEPWORTH, Esq., M.Inst.C.E.,

Gas-Works, Carlisle, Jan. 13, 1894.

Messrs. WORMALD BROS., Eccles, Manchester.

Gentlemen, — I have had your STOP-COCKS, with PATENT LOCKING ARRANGEMENT, in use for some time past, both in the Gas and Water Departments. In the Gas Department, it has proved itself useful in cases where it was necessary to temporarily discontinue the supply of gas; and thus obviated the removal of the meter, or the stoppage of the supply in any other way. We have also found the Taps to be of considerable advantage when attached to gas-cookers and gas-fires, and much waste and annoyance have been prevented by their use. If you care to refer anyone to me, I shall be glad to answer any inquiries.

Yours faithfully,
J. HEPWORTH, M.Inst.C.E.

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The "S.M." CAST-IRON COOKER,

Specially designed, and strongly constructed for Gas Companies using the Automatic Meter.

This Stove has an Oven large enough to take a 10-lb. Joint, and is fitted with Dripping-Pan, two Grids, and one Sheet-Iron Shelf, Cross-Bar, and Meat-Hook. The Hot-Plate is fitted with two Boiling-Burners, Heat-Deflector, Pan and Grid, and will also Grill Chops, Steaks, Toast Bread, &c. At a practical test made by a Gas Company, 4 lbs. of Meat and two Vegetables (3 lbs. of Potatoes and a good sized Cabbage) were thoroughly cooked at the cost of 1½d.; the Gas being passed both through a Test and an Automatic Meter. Such a meal may be easily prepared and served in an hour-and-a-half, burning only 26 cubic feet of Gas in an hour-and-a-quarter—an economic consumption probably never obtained before. This marvellous little Cooker roasts, bakes, boils, &c., to perfection.

DIMENSIONS.

HOT-PLATE: 14¾ in. wide, 15½ in. deep.

DOOR OPENING: 18 in. high, 11½ in. wide.

INSIDE ROASTER: 21 in. high, 11½ in. wide, 11½ in. deep.

PRICES: With Deflector, Pan, and Grid, **£1 17s. 6d.**; without, **£1 15s.**

The Oven is fitted with two Burners, so arranged that they can be readily taken out for cleaning, and replaced without disconnecting the Stove.

The "CAM" CAST-IRON COOKER.

We can strongly recommend this Stove to the notice of intending purchasers, as it contains all our latest improvements in Single-Cased Stoves; and, considering the points of strength and general finish, it is decidedly a cheap Kitchener for the money.

It is fitted with three Ring-Burners and Grilling-Burner, and Deflector, Pan, and Grid. The top plate beneath Hot-Plate is **enamelled white.**

REQUIRED SPACE: 27½ in. high, 18 in. wide, 16½ in. deep.

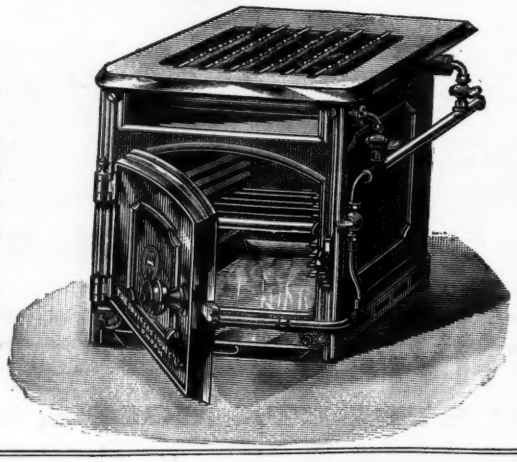
INSIDE DIMENSIONS OF ROASTER: 21 in. high, 11½ in. wide, 11½ in. deep.

Price - - - - - £3

The "BRADFORD."

This Stove has been specially designed for use on the top of ordinary Kitchen Ranges, where room cannot be spared to fix it separately. It is made entirely of Cast Iron, with two Wrought Burners, one 4 in. by ½ in., the other 4 in. by ⅜ in., and has Grid, Bar, Meat-Hook, and Dripping-Pan.

The Oven is fitted with our Patent Regulating Jet.



REQUIRED SPACE.

High.	Wide.	Deep.
18½ in.	17½ in.	20 in.

SIZE OF OVEN INSIDE.

High.	Wide.	Deep.
15 in.	14 in.	11½ in.

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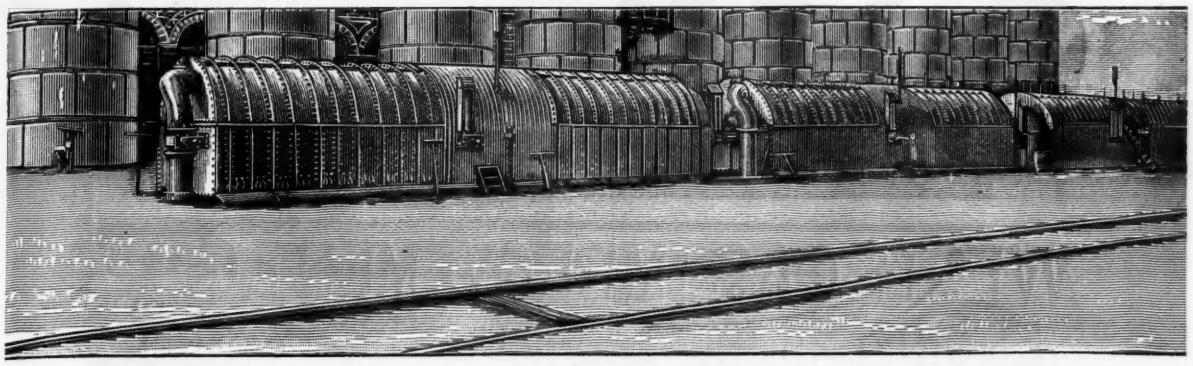
☛ **467** of these Machines (capable of dealing with **447,807,000** cubic feet of Gas daily) have been supplied, which fact is given as evidence of this apparatus being the Most Efficient of any in the Market for the extraction of Ammonia, Carbonic Acid, and Sulphuretted Hydrogen from Coal Gas.



View of SIX PATENT "STANDARD" WASHER-SCRUBBERS, erected at the Beckton Station of The Gaslight and Coke Company (the Engines driving same being under Galvanized Iron Covers). This Company has **27** of these Machines in use, and Two more, each for 3½ million feet per day, are in course of construction for them. They are also in operation at a great number of Gas and other Works in this Country and abroad.

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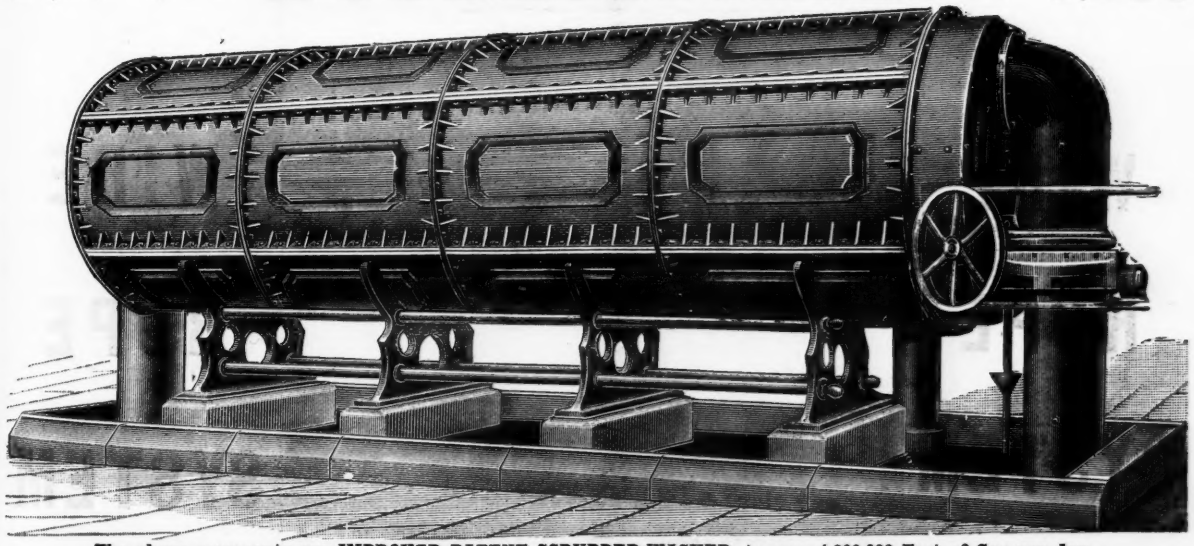

The above represents our IMPROVED PATENT SCRUBBER-WASHER, to pass 1,000,000 Feet of Gas per day.

These Washers are guaranteed to present a larger area of Wetted Surface (size for size) to the action of the Gas than those of any other Maker.

Results unapproached by any other system. *References and full particulars on application.*

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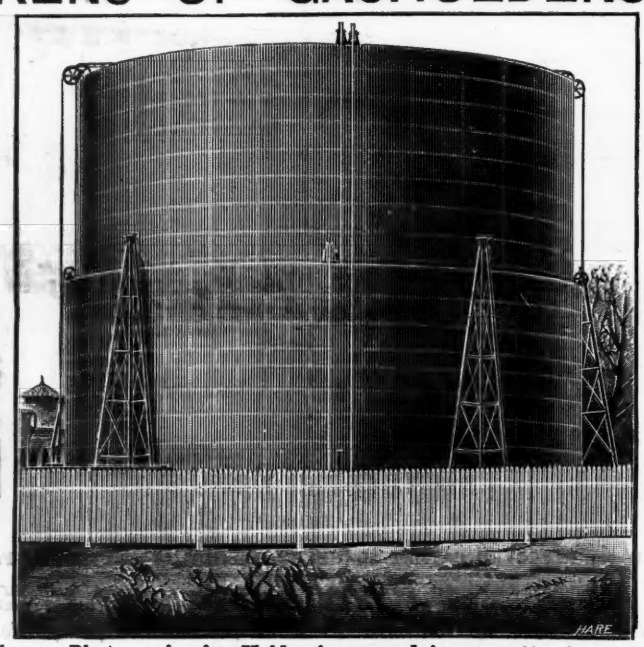

WIRE ROPE SYSTEM

This Engraving is taken from a Photograph of a Holder **increased in capacity from 32,000 cubic feet to 59,000 cubic feet** by the addition of a Lift. The Ropes are applied to both Lifts to supplement the Standards.

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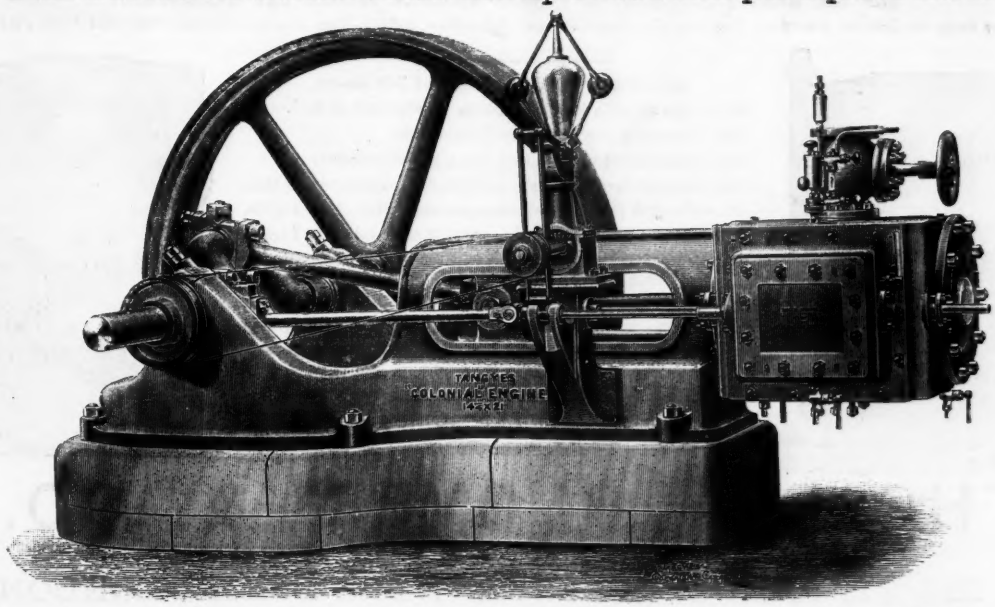

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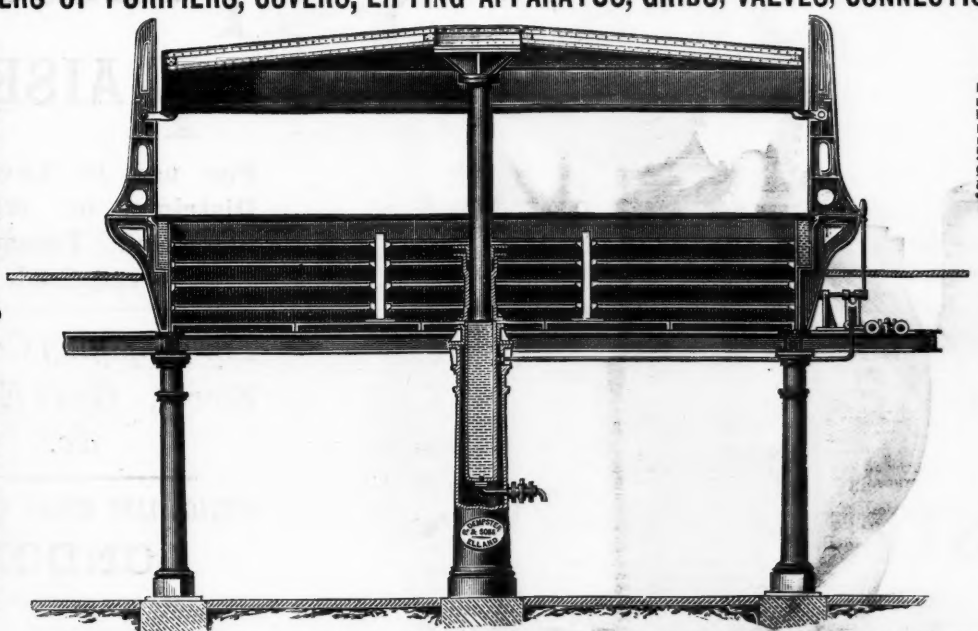
PURIFIERS erected on Stage-Floors, with Elevators.



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LIFTING APPARATUS of every variety.
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OUTLET SHOOTS, CHARGING TRUCKS, and all FITTINGS.

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The Covers are raised and lowered by the movement of a Lever attached to a specially arranged Valve, and are perfectly under control.

ROSE MOUNT IRON-WORKS, ELLAND.

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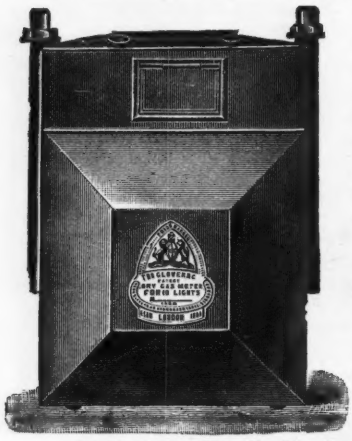

1st.—Are a remedy for all the defects of Wet Meters.
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6th.—Prevent jumping or unexpected extinction of the Lights.
7th.—May be fixed either above or below the level of the Lights.
8th.—Cannot be tampered with without visibly damaging the outer case.
9th.—Will last much longer than Wet Meters.
10th.—Will not cost more than one-half for repair that Wet or Water Meters do.

Are upheld for five years without charge.

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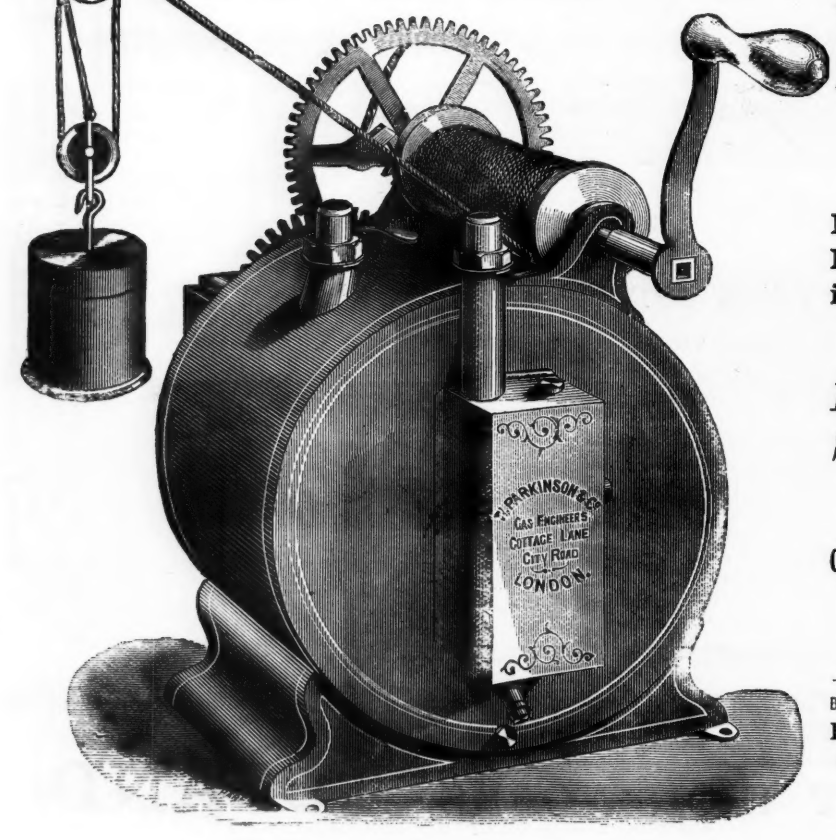

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TO CORRESPONDENTS.

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THE

JOURNAL OF GAS LIGHTING,

WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, FEBRUARY 20, 1894.

Mr. Livesey's Speech at the South Metropolitan Meeting.

THE South Metropolitan Gas Company held their ordinary general meeting on Wednesday last, as will be seen by the report of the proceedings which appears in another column; and the Chairman—Mr. George Livesey—took the opportunity of making an unusually long and important speech, in the course of which he ran over most of the questions of the hour in connection with gas supply. He began by disposing, so far as the Company are concerned, of the delusion so industriously put about by the miners' leaders during the recent coal strike, that gas manufacturers grind their coal contractors down to unremunerative prices. It is not the first time that Mr. Livesey has taken occasion to speak well of the colliery proprietors from whom the Company draw their main supplies. Now he has explained in the clearest language the style in which the South Metropolitan Board deal with their coal contractors; and it is creditable to both parties that buyers and sellers should have continued to do business with one another on the basis of annual contracts—in one case from the year 1838, and in a second case for more than thirty years without a single break. Like Colonel Makins at the Chartered meeting the previous week, Mr. Livesey does not propose to tamely submit to any combination that may be formed among the northern colliery proprietors with a view to forcing up the price of gas coal. Naturally enough, the coal people may say—and, according to certain newspaper reports, they actually do say—that they cannot see why they should supply coal to Gas Companies at prices which enable the latter to pay dividends of 12 and 13 per cent. For reasons of his own, which appeared farther on in his speech, Mr. Livesey was prepared to allow the colliery proprietors to raise this question of Gas Companies' dividends; but he was careful to show that, whether or not these dividends are reasonable, it is not within the power of coal contractors to affect them by the way of enhanced contract prices. Rightly or wrongly, gas dividends are for the Legislature to settle, not for coal contractors to play with.

This consideration led Mr. Livesey up to his great point—the expediency of the conversion of gas capital to a uniform denomination bearing a closer relationship to the actual return to present-day investors. He did not mince the matter—Mr. Livesey never does this sort of thing by halves—but declared roundly that the conversion of high-priced gas capital into 5 per cent. stock is "a "perfectly fair and just proceeding, and that at present "the method of issuing capital is misleading, unjust, and "unfair." Of course, the Chairman was bound to remind his constituents that the statements in the Directors' report on this head, and his own remarks upon it, were "simply so much information at present;" for he was not in a position to say what the Board thought of doing in the matter, or what they imagined could be done. Whatever is done must be by authority of Parliament; and Mr. Livesey does not consider the present time suitable for more than a discussion of the subject. All the same, we venture to suggest that any time will serve for taking in hand a promising economical reform; and a case of this nature may well be dealt with when there is no pressing need for accepting any result that may happen to issue from parliamentary proceedings.

It was not to be expected that Mr. Livesey would sit down under the implications conveyed in the extraordinary comparison between the conditions and results of gas supply on different sides of the Thames to which Colonel Makins was induced to give currency at the recent meeting of The Gaslight and Coke Company. It did not require any particular foresight to perceive that, on the very first opportunity, the South Metropolitan Chairman would have something to say concerning that remarkable *tour de force* of accountancy which offered to reduce the difference between the economical conditions of his own and the Chartered Company to a matter of the hundredth part of a penny. It was an error of judgment to put such a piece of statistical cobwebbing before the world; and it has only had the effect of eliciting from Mr. Livesey the unqualified, uncompromising statement that "there is no reason why the Company which supplies "the finest district in the world should not sell gas as "cheaply as it is sold in less favourable parts." This comment strikes the root of the matter, and goes beyond statistics to their makers.

The last part of Mr. Livesey's speech refers to the vexed subject of employers' liability and workmen's insurance. It must surely be impossible for anyone not temporarily blinded by political prejudice to disagree with the observations that workmen engaged in an industry who happen to sustain injury should receive compensation, and that relief ought not to be restricted merely to the two or three per cent. of the sufferers through their employers' negligence, or to the five or six per cent. who might be victims of their comrades' carelessness. Mr. Livesey spoke not less truly than eloquently when he said "he had not been connected with the business all "these years without becoming convinced that, of all the "distressing circumstances connected with their business, "the most distressing might be said to be those cases "where a workman perhaps lost his life or was seriously "injured by an accident for which neither the workman "nor anyone else was responsible." He went on to give

some interesting particulars of the working of the South Metropolitan accident provision and investigation systems; and ended by speaking his mind once more about the "blatant demagogues" who live by setting employers and employed by the ears. There was a short discussion of several points raised by the Chairman, who replied to some questions by different proprietors; and, altogether, it could not have been felt by any shareholder who attended the meeting that he had lost his pains.

Two Presidential Addresses.

Both the Midland and the Southern District Association of Gas Managers met last week; and the proverb which says that "it never rains but it pours" is again exemplified in the fact of our having to publish together the Inaugural Addresses of the Presidents of these useful technical societies, after a long dearth of similar matter. Mr. R. O. Paterson is one of those gas engineers and managers of whom it can be truly said that the world hears too little; but whenever he does speak, as he did to his Midland associates last Thursday, he is assured of an attentive hearing. His address on this occasion is not far from being a model of form and matter; and every coal carbonizer in the kingdom may profitably study what he has to say on this most important subject. It is generally known that Mr. Paterson is a sworn foe to the hydraulic main; and he is never at a loss for reasons in support of his views upon retort-house practice, the results of which at Cheltenham are known far and wide. For several years past Mr. Paterson has been working upon the problem of carbonizing coal in ordinary retorts to gas and coke, with ammoniacal water, but little or no tar. He claims to have so dealt with the coal and tar of a charge in the same retort as to have obtained a production of from 13,000 to 15,000 cubic feet of gas per ton; but, of course, this was experimental working. Upon this head Mr. Paterson's remarks are explicit. He says "this matter must press "itself to the front sooner or later. A valuable hydro-"carbon like coal tar should never be allowed to leave "our works as such. I believe, if the right means are "adopted, it might all be converted into gas." This is an old dream of the coal carbonizer; but Mr. Paterson is evidently one of those who believe that some old fancies cover germs of truth which modern science may be capable of developing. At any rate, he must entertain strong views upon the subject, or he would never have taken up the position in regard to it which renders his Stourbridge address so remarkable a pronouncement. We may expect to hear further from Mr. Paterson on this particular head on a future occasion.

The Inaugural Address of Mr. H. Smythe, of Maidstone, to the members of the Southern District Association was of a severely practical character. It began by dealing with the pressing question of coal storeage, which recent events in the coal trade have forced into such prominence. Mr. Smythe speaks of "ventilating" coal in covered stores by timber shafts a foot square; and we are glad to note that he regards the value of such an arrangement as doubtful, from the point of view of ventilation. As a matter of fact, the plan is not to be recommended on any account; iron piping being preferable as a means of obtaining access to the interior of a coal-pile for the purpose of taking thermometric tests or smelling out fire. The remainder of the address was devoted to a modest account of the President's technical observations and experiences at Maidstone; and it shows very pleasantly how much scope there is for a thoughtful, yet reasonably energetic, professional man, in providing for the wants, in the matter of gas supply, of an English market town.

The Government and the Employers' Liability Bill.

The fact of the Government having escaped defeat in the House of Commons in a crucial division upon the Employers' Liability Bill, by a bare majority of two, is so significant of the weakness of the position into which the Administration have blundered by following the lead of Messrs. Burns, Cobb, and their like, that it is scarcely necessary to offer any comment upon the state of affairs. Of course, the House of Lords will insist upon their amendments; for they are not to be overawed by the small force that supports the Government. Their Lordships' reasons for maintaining their ground in this regard have been issued in the form of a parliamentary paper, which states that "the existing arrangements are preferred, by "the large majority of the working men who are parties "to them, as more than an adequate substitute for the "advantages conferred by the Bill; and the addition of a "proviso will enable any workman of a contrary opinion "to release himself from the agreement." It is also stated that the Lords think it "unwise to prohibit, in the future, "agreements which have been proved to be appreciated "by, and for the benefit of, the workmen at present; and "additional safeguards may be introduced which will "secure an effectual protection for the workmen." Nevertheless, the Government will drop the Bill, or the Trades Unions will revolt. This result will not make much difference to anybody; for the Bill, or some measure embodying its best features, will become law before long, and meanwhile the existing associations will keep their money. During the last few days, the cause embraced by the House of Lords has been strengthened by the disclosure of accident statistics applying to the South Metropolitan Gas Company and the London and North-Western Railway Company, and has also received the adhesion of his Honour Judge Hughes—better known and loved wherever the English language is spoken as "Tom Hughes"—who testifies from twelve years' County Court experience of the Crewe-Stockport circuit. Mr. Hughes states that two-thirds of the cases under the Employers' Liability Acts that have come within his purview have gone for the employers; and he lays stress upon the hardship that will be done to working men if they are driven to bring into Court every claim for personal injury. He remarks upon the fact that "the present representatives of the "Trades Unions in Parliament oppose all contracting out "of the Act, however beneficial the terms may be, and "claim to speak the mind of the Unions in their resolute "determination to destroy, if possible, even the London "and North-Western Company's arrangements with their "workmen;" but he goes on to say that he can hardly believe his eyes when he reads their speeches. Mr. Hughes was a member of both the Royal Commissions on whose reports the Trades Unions were given a legal *status* and protection for their funds; and he admits that he used to admire the Union leaders of forty years ago for their sturdy independence. Now this fine quality is gone, and the New Unionists have no higher desire than "to reduce all men to one level by Act of Parliament." After all, however, these gentry are not going to have their own way in everything, so long as the British Constitution remains in its present form.

The Period of Repayment of Municipal Loans.

In connection with the electric lighting experiment of the St. Pancras Vestry, there has been raised a question of more than local interest, and one, moreover, upon which certain experiences of local authorities owning gas undertakings throw some light. It is a question, mainly, of the principle upon which the period for the repayment of money borrowed upon the security of the rates for industrial purposes should be determined. The St. Pancras Vestry have asked the London County Council to advance a sum of £30,000 to be spent upon electrical works and plant, besides land and buildings, and they wanted to spread the repayment over 42 years; this being the duration of an Electric Lighting Order under the Act. The Finance Committee of the County Council, however, ascertained that a proportion of the money was to be spent upon machinery of a very temporary character, while very little of the property to be acquired would last for the full period covered by the St. Pancras Order. Consequently, the Committee advised the Council to insist upon the period for repayment being calculated with regard to the life of the objects purchased out of the loan. To this course the Vestry objected; claiming that the question of repayment should be settled with reference to the borrowers' credit and the nature of the security offered, and not upon that of the lifetime of their plant. In other words, they deny the right of the lenders to go beyond their undertaking to pay back their loans at any period they choose to name, seeing that the security offered is not the objects upon which the money is spent, but the rates of the parish. Both views have advocates on the Council; but for the present the majority are averse to the claim of the Vestry to be sole arbiters of the period within which parish loans shall be repaid. On the other hand, the Council do not agree with the proposal of their Finance Committee to base terms for repayment strictly

upon the estimated life of the various things upon which money borrowed by a responsible Local Authority may be spent; and accordingly they have just determined upon a middle course, which, by fixing the duration of an electric lighting works loan at 25 years, prevents the present generation of ratepayers from unduly burdening posterity. The example of municipal gas-works loans has been cited in the controversy; Mr. T. Eccleston Gibb, the Vestry Clerk of St. Pancras, being reported as having said that since municipalities have been allowed to spread the initial cost of acquiring gas and water undertakings over 60 or 80 years, he could not understand why a long period like that was not allowed in the case of electric light works. Surely, there should be no difficulty in understanding such a simple point. There is no limit to the life of a statutory gas or water undertaking, as there is for an electric lighting undertaking; and the long periods for repayment, even in the cases of the former, have only been granted by Parliament when there have been heavy payments for goodwill, &c., to clear off. Loans spent in extending works are now-a-days rarely spread over a longer period than the lifetime of one generation, even in the case of a profit-earning gas-works.

The Proposed Coal Sales Association.

In another column will be found what must be regarded as the authoritative explanation of the nature and objects of the Association which has been formed to control, so far as may be possible, the prices of Durham and Northumberland coal. It will be noticed that the statement is couched in language the reverse of combative, and seeks to keep upon common grounds of fact and inference. Those who are responsible for promulgating this declaration allow it to be gathered from their words that they speak for 80 per cent. of the Durham output; but how far the Northumberland colliery owners are interested in the movement does not transpire. The object of the associated colliery proprietors is declared to be no more than that of diminishing "the evils which "are commonly supposed to arise from unrestricted and "unorganized competition," of which the most important are "the great variations in price to which the trade is "now subject." Of course, nobody is to be hurt by the action of the Association, if successful. "There is no "intention to seek to raise prices to such an extent as "to prejudice the maintenance and development both of "the coal trade itself and of the industries dependent "upon it." It is conceded that the rise and fall of prices are probably beyond the control of any organization, even though as powerful as the one in contemplation; but it is argued that careful watching of the changes may permit the members of the Association to minimize or guard against dangers which they cannot altogether prevent. "An attitude of explanation and co-operation will be "adopted towards Gas Companies," and other large consumers; and "the making of contracts of longer "duration than twelve months, except on sliding scales "varying with the price of manufactured products, will "be discouraged." Thus explained, the framers of the Association profess their inability to see why their proposed organization should be viewed in any but a favourable light "both by the men whom they employ "and by the consumers whom they supply." It is not for us to speak for the men, who would probably support the idea of any "ring" that should have the effect of keeping up coal prices, and consequently wages. As to the way in which consumers will regard the proposed Association, this depends upon what it does. Most trades have commercial associations of some kind; and the traders rarely ask leave of their customers to join them. A trade protection society is one thing, however, and a "ring" for illegitimately forcing up prices is another. Speaking generally, we have no sort of objection to trade combinations, provided their objects are reasonable, and they are reasonably conducted. One of the proposed objects of the projected Coal Association—the abolition of long contracts—has always been favoured by the JOURNAL, which has likewise maintained the principle that a fair price, from which the owner could depend on obtaining a fair profit and the miner could earn a fair wage, should always be paid for gas coal. We do not say, however, these considerations are enough to engage our support for the Association in question, or for any organization appertaining to a single party in the coal industry.

WATER AND SANITARY AFFAIRS.

A well-considered and useful statement was made by Sir H. E. Knight last week, in explaining to the shareholders of the Southwark and Vauxhall Water Company the nature of the plans embodied in the Bill which the Directors of that Company are about to introduce into Parliament. The only objection which the meeting offered to the Bill emanated from Dr. Chesshire; his contention being that three-quarters of a million of additional capital was a larger amount than need be asked for. Power to raise such capital, we presume, will simply be exercised by the Directors as occasion may require; and full benefit will be taken in respect to the sale of surplus land at Battersea. The fear that the County Council will, at some future day, obtain possession of the works "at "the price of old iron" need not be seriously entertained. Should "purchase" ever come to pass, it is with the earlier constructed portions of the water-works that antagonism will most probably arise; the County Council endeavouring to show that they ought not to be charged for capital expended on works which have subsequently been superseded. A calm review of the case will show that the Directors of the Southwark and Vauxhall, and of any other Water Company, are perfectly justified, and also reasonably safe, in doing all that is required to maintain the supply in a condition adequate to the wants of the population, and in conformity to the modern demands of sanitary science. Resistance from the County Council will doubtless be offered to the project thus brought forward; but the Southwark and Vauxhall Company will be able to show that they are simply moving in the direction pointed out by the Royal Commissioners. The proposed works will absorb some half-dozen years in their execution; and by that time there will be a sensible increase in the consumption of water. The scheme when carried out will be one of a commanding character; the old and new works combined extending nearly a mile along the Thames at Hampton. Storeage will be immensely increased, so as not only to equal the demands of the Royal Commissioners, but somewhat to exceed them. Filter-beds will amount in all to an area of 26 acres. Extra engine power will be provided; and in all respects a well-matured scheme seems to have been devised. If the project looks large, it is not larger than the exigencies of the case require. The Royal Commissioners recommended that the Companies should have a storeage equal to at least fifteen days' consumption; and as 450 million gallons will be consumed during that period in the Company's district a few years hence, an approximation to 500 million gallons is the practical answer to the demand made by the official report. Without doubt the Chairman was fully justified in his statement that the Directors proposed to undertake the smallest amount of work which could enable them to meet the requirements of the Royal Commission. The shareholders have approved the Bill; and it is to be hoped it will receive the unbiassed consideration of Parliament.

The Management of the Margate Gas-Works.—Mr. H. H. Jones (son of Mr. H. E. Jones, of the Commercial Gas Company, and recently Assistant-Engineer at the Bombay Gas-Works) has been appointed Manager of the Margate works of the Isle of Thanet Gas Company.

The Young and Bell Oil-Gas Process.—Messrs. R. and J. Dempster, Limited, of Newton Heath, Manchester, have made arrangements with the Oil-Gas Enrichment Company, of Edinburgh, to act as their agents for the introduction of the above process. Our readers are aware that Messrs. Young and Bell's system of enrichment is in use at the St. Helens Gas-Works, where, we understand, it is giving very satisfactory results, and where it has been inspected by a large number of gas managers in the Manchester and North of England districts. It is already in operation in fourteen works; and there are prospects of its more extended adoption.

Death of the City Surveyor of Worcester.—We regret to record the death, on Monday, the 12th inst., at the age of 70, of Mr. S. G. Purchas, M.Inst.C.E., the City Surveyor of Worcester—a position he had held from 1856. Mr. Purchas was associated with the sewage works which were carried out through the whole of the city in 1855; and two years later he was, as Resident Engineer, connected with the construction of the water-works; the late Mr. T. Hawksley being Chief Engineer. Mr. Purchas also assisted in the extension of the water-works (which is still in progress), and latterly with the electric lighting undertaking. The deceased had been in impaired health for some months before his death.

ESSAYS, COMMENTARIES, AND REVIEWS.

GAS AND WATER COMPANIES IN THE STOCK MARKET.

(For Stock and Share List, see p. 352.)

Business on the Stock Exchange during the past week has been quiet in most of the markets; and the general tendency has been firm and steady in regard to securities of good character. The choicest investments were a little higher; while others, after some fluctuations, closed at a slight advance. But at no time were transactions more than limited. There was a disposition to snap a profit wherever it could be obtained. One feature of the week was increased activity in the more speculative issues. Beer and meat concerns were the vehicles of a lot of smart dealing, as bulls and bears tried to corner each other; but the public probably had no great hand in the game. The settlement was easy, and gave rise to no complications. Money was in fair demand for it. But the discount market was very easy; and it was quite on the cards that the Bank of England rate might have been lowered on Thursday. Business in the Gas Market was considerably less active; but its firmness and strength were unimpaired, and of the numerous changes effected in quotations nearly all are in the upward direction. In Gaslights, the "A" was moderately dealt in, but showed no disposition to advance; and the *ex div.* quotation is a point worse. There was good business in the secured issues; and nearly all are quoted at a nice rise. South Metropolitans were much more brisk, and very strong, especially after the satisfactory statements with regard to coal and other matters made by the Chairman at the general meeting. Commercials were quiet and firm; the debenture stock going up higher. The Suburbans and Provincials were strong generally; and Bromley and Crystal Palace are dearer. Among the Continentals, Imperial made a further recovery; and Union and European were very firm. The rest presented no remarkable feature beyond a slight retrogression in San Paulo. Business was very limited in the Water Companies; but all were very firm, while two or three rose higher.

The daily operations were: The Gas Market opened sluggishly, and was quiet all day. Imperial Continental rose 1. Business was a shade more brisk on Tuesday; but changes in quotation were rare. Imperial Continental improved another 1½; and Crystal Palace, 2. Wednesday was a still more active day; and prices were good, although no change took place in quotations. On Thursday, business relapsed again into quieter proportions; but the general firmness was evidenced by several advances in value. Commercial debenture stock rose 3; South Metropolitan "A" and "B" and Imperial Continental, 2 each; and Bromley 7 per cent., ½. Southwark Water gained 2. Friday's business was not remarkable. Southwark improved 1; and ditto "D," 2. Saturday was quiet, as usual; and quotations remained unchanged.

ELECTRIC LIGHTING MEMORANDA.

The City of London Electric Lighting Company's Affairs—The Profits of Electric Lighting in Chelsea and the Strand—The St. Pancras Loan—Mr. W. H. Preece on Electric Lighting in America.

The ordinary general meeting of the City of London Electric Lighting Company is called for Thursday, when the Directors' report and statement of accounts relating to the working of the undertaking for the past year will be presented to the assembled proprietors. It appears that the capital called up amounted by the end of the year to £799,610, of which £400,000 is in ordinary, and the remainder in 6 per cent. preference shares. In order to provide for the additional expenditure which will be necessary to complete the undertaking, the Directors propose to issue debenture stock from time to time as required, and will begin with £100,000 worth immediately. No intimation is given of the extent to which this method of obtaining additional capital will be employed before it will be possible to close the account; but the holders of ordinary shares must be quite resigned to the thought that they are not likely to be troubled with dividend warrants for some time to come. The gross revenue of the Company for the year was £38,556. From this are deducted the expenses of generation and distribution, amounting to £18,374; repairs and maintenance, amounting to the handsome sum of £2285; and rates, taxes, and general charges to the extent of £2431. There remains what is called a "net revenue" of £15,464, out of which the Directors propose to pay the preference dividend, and carry forward £3041. Thus it is still the "day of small things" with them, though the report claims that the business is growing satisfactorily.

Two other Metropolitan electric lighting companies—the Chelsea and the Charing Cross and Strand undertakings—have made up their accounts for the past year; and while the former comes out with a proposal to divide 5 per cent. on the ordinary shares, the latter has to be content to make up the total distribution for the year to 4½ per cent., carrying forward the magnificent balance of £43. Both these Companies are well-established concerns, having good districts, and with nothing to prevent them enjoying all the prosperity due to the successful carrying on of their business. The Chelsea Company is indeed one of the oldest, if it is not the oldest, local undertaking of its kind in London; and the managers should know by this time what their future is likely to be. It is noteworthy, moreover, that these Metropolitan district electric lighting companies seem to fare very similarly, in regard to pounds, shillings, and pence, notwithstanding the diversity of the "systems" of generation and supply which they represent.

The subject of the St. Pancras electrical works loan came again before the London County Council last Tuesday, when the Finance Committee submitted an amended proposal that the term of repayment for the whole loan of £30,000 should be 25 years. This proposal was opposed by the Vice-Chairman of the Council, who moved to refer the recommendation back to the Committee, with an instruction that, as the money was required, not for renewals, but for initial cost in establishing remunerative electric lighting works, it should be lent for the full term. Mr. Harrison made a great point of this matter; arguing that, as the various municipalities owning gas-works are not required to repay gas loans within periods calculated with reference to the life of gasholders, &c., so a Metropolitan local authority who have sufficient enterprise to embark upon electric lighting should be excused from bearing in financial remembrance the perishable nature of the plant. The debate was of an interesting and important character, from the way in which municipal gas finance was cited to elucidate the claims of the St. Pancras Vestry. It was sought to be maintained that gas loans are invariably granted for long periods, and without reference to the objects for which the money is required; but Alderman Arnold was able to refer to his own experience as a member of a House of Commons Committee that had sanctioned a loan for the town of Bury for 27 years. The Alderman also showed that the remunerative character of the work is a reason for shortening rather than lengthening the term of the loan. Mr. B. L. Cohen took very much the same line; pointing out that in from five to twelve years there will be absolutely nothing remaining of the plant for which St. Pancras desires to borrow. Mr. Buxton also showed that if they had their will in the matter, the Vestry would be compelled, after using up the first set of generating machinery, to borrow again for a second supply, or to continue the use of worn-out, obsolete, and uneconomical plant. In time the ratepayers would be paying the instalments of three separate loans for successive machines doing the same work. In the event, the view of the Progressive Party in the Council, as represented on this occasion by the Vice-Chairman, was defeated by a substantial majority; and consequently St. Pancras will have to do the best it can with a 25 years' loan, instead of spreading its responsibilities over 42 years. In arriving at this decision, the London County Council struck a blow in the cause of sound finance which cannot fail to have an excellent effect beyond the immediate business in hand. It notifies in this way to local authorities that, in their enterprising adventures upon electric lighting, they must bear in mind the rights of future ratepayers, which are not to be given away in order that the present generation may indulge in superfluous luxuries. The warning is not likely to be wasted.

Mr. W. H. Preece has been telling the Institution of Electrical Engineers what he thinks about the electrical industries of the United States—which is almost as interesting as it would be to hear what the American electricians think about Mr. W. H. Preece. A good deal of this particular statement is merely a "chronicle of small beer;" but not even the eminent electrical adviser of the Post Office can talk for several hours without saying something; and there is a scrap or two of information to be gleaned from his latest American reminiscences. He admits, for instance, that "electric lighting has not generally made the rapid progress during the past nine years in the States that was expected from its great rate of growth during the previous four years." In other words, the legitimate crop was soon reaped, after which there was nothing but "wild speculation, hasty construction, fatal accidents, and frequent failures" to react on steady progress. At the same time, electric lighting has made great headway throughout the States; but Mr. Preece is unable to report any notable improvement in systems or plant. As regards incandescent electric lighting, Mr. Preece remarks that, while this is more commonly found in public buildings in America than on this side, in private houses it is less used than with us—which is not saying very much for the prospects of central station lighting in the States. Lastly, Mr. Preece admits that owing to the absence of proper control, "the accidents in the States are terrible in their number and fatality; and they strike the observant Englishman with dismay." On the whole, he assures the English people that they have much reason to be thankful for the Electric Lighting Acts and the Board of Trade.

Award of Prizes to Mr. J. H. Canning.—On Thursday, the 8th inst., Mr. F. Phillips, the Mayor of Newport (Mon.), presented the Town Silver Medal—the highest awarded—to Mr. J. H. Canning, eldest son of Mr. T. Canning, Assoc.M.Inst.C.E., Engineer of the Newport Gas Company, for taking first class in chemistry, with several prizes in the same subject, in the Science Examinations recently held. Mr. Canning studied under Mr. Thompson, F.C.S., of Newport, and Principal Bush, of the Technical School.

GAS IN THE MAGAZINES.

It speaks well for the attractive nature of the problems indicated under the term smoke abatement, that, although the character of the climate of the United Kingdom during the past year has been exceptionally good, the discussion of what should be done to render the air of London and other large British towns permanently clear of smoke has not been suspended, but on the contrary has been proceeded with vigorously in the pages of two leading magazines, and has formed the subject of popular lectures in different parts of the country. It is incumbent upon us to take account of all contributions to the literature of this important department of sanitary science, especially when they come from outside, non-technical sources. Of pronouncements on the subject which come from professional, and therefore in a sense authoritative sources, we have to keep a record, as a matter of course; but it is not the least interesting aspect of the "cause" of smoke prevention that it forms a borderland between technicians and the intelligent public, wherein representatives of both orders of the community may disport themselves amicably together. It has long been conceded that the gas industry has more connection than any other established agency of civilization with the reduction, and possibly with the eventual abolition of the smoke nuisance of towns, or with at least so much of it as is not directly traceable to industrial furnaces. But the fact remains that gas engineers have no monopoly of the public discussion of the subject. Indeed, this is a matter in regard to which there are no experts, properly so called; so that the intelligent outsider may claim as good a right to have his suggested remedy for the evil of town smoke discussed by an interested auditory as can be granted to any person of exclusively technical training. We are particularly anxious to preserve the reputation of the practitioners of gas engineering for having an open mind respecting all such matters as the part capable of being played by gas in connection with smoke abatement, and are desirous of paying every attention to magazine articles, and other popular methods of dealing with the subject. For directly a writer, whatever his previous training, takes hold of the problem of smoke abatement with anything like a firm grip, he realizes the preponderating part played by gas in the lighting and heating service of our town populations. He sees, as he never saw before, that gas is the townsman's friend; and it is the exception rather than the rule if he does not arrive at the conclusion that in gas lies the townsman's hope of salvation from the smoke nuisance.

The first of recent contributions to the literature of the subject that appeals to us for notice, is a somewhat pretentious article entitled "Smoke," appearing in the January number of the *Pall Mall Magazine*. Cleverly done, and strikingly illustrated, like most of the contents of this magazine, Mr. Ernest Hamilton's article is worth reading for its title and its style. It contains, moreover, a goodly number of plain truths picturesquely set forth; and it carries the reader on with a jauntiness of diction that seems to be born of strong conviction. Surely, a reader would think, no man would venture to open a case in this way unless he was sure of his ground? Alas! Is not random assertion without proof a characteristic of end-of-the-century journalism; and shall the magazines be free from it? Mr. Hamilton begins well with a smart antithesis. He enlarges upon the contrast between the importance and the wealth of London and its dirt. "London is the largest and richest town in the world; it is also a town of considerable historic interest, and of amazing commercial activity; but it is not a clean town. Foreigners and strangers to our great Metropolis are chiefly impressed by its vastness, its ceaseless street traffic, and it unparalleled dirt." And the writer goes on to remark upon the strangeness of this feature of London, in view of the fact that it is the capital of the cleanly nation of Europe. English people wash themselves, but not the exteriors of their houses, their street pavements, or their town thoroughfares. Mr. Hamilton thinks this is due to the prevailing idea that it is useless to fight against the all-pervading grime deposited by the smoke-laden atmosphere. This reduces all town buildings, however ornate when new, to a dead level of dirt and dulness. "And if the external disfigurement of our houses is a grave question, far more so is the ceaseless deterioration of our house fixings and decorations. It has been estimated that in the fashionable quarters of London, the annual depreciation in the value of property due to smoke alone, irrespective of ordinary wear and tear, averages not less than £100 per house. In the case of large shops, flats, clubs, and hotels, the loss is, of course, considerably greater. The loss to milliners and drapers, through the impairment of fabrics of delicate tint and texture, is in itself enormous. We may then fairly estimate that the amount of the annual damage caused to property in London by smoke alone, is represented by several million pounds sterling." Yet withal Mr. Hamilton confesses that the bulk of Londoners take very little interest in the matter.

Some more writing, pleasant enough to read, if not particularly original or striking, leads Mr. Hamilton to the conclusion—not a novel one, either—that "the eventual solution of the difficulty will probably be found in gas, or possibly in a combination of gas and coke." No sooner does he form this salutary opinion, however, than he proceeds to show how little he really knows of the matter by remarking that "gas, as at present manufactured by the great London Companies, is unsuited for heating purposes, on account of its prohibitive price; but gas of a very much cheaper quality, but equally effective for heating purposes, could be easily turned out at a profit to meet any extensive demand." It is a pity that Mr. Hamilton, who has a pretty wit, did not take the trouble to make a few inquiries upon this head before repeating such a parrot's tale. He betrays his amateurishness again, in stating that the initiative in the purification of the air of London from smoke should be taken by "the great owners of house property, holders of long leases, hotel proprietors, and shopkeepers," in combination with "the responsible public bodies." What a combination this would be! Moreover, as a West-Ender, Mr. Hamilton looks to the aristocratic quarter to begin the movement. He forgets that the classes to whom he thinks to appeal, and the region which he has in view, never originated anything yet. Just as the West-End was the last to be connected with the main drainage system of the Metropolis, so it would be the last to adopt gaseous fuel in its own or in the public interest. Mr. Hamilton regards gas at 1s. 6d. per 1000 cubic feet as the panacea for London smoke; and doubtless this would be a great boon for London. Even so, according to the nature of things, it would be St. Giles's that would first discover the benefit of cheaper gas; and if the time should come when there could be said to be only one smoky house chimney in London, it would be to Park Lane that we should go to find it.

The other magazine article that we have to notice in this connection, is entitled "Gas as a Sanitarian," by Mr. Lynn Cyril D'Oyle, and appears in the current number of the *Gentleman's Magazine*. This pleasant writer is an old acquaintance; and we are glad to welcome him again in his chosen part of champion for pure town air. He has been turning the subject over and over in his mind for the past year or two, with the result, as he now announces, that if he could afford to build a house for himself, he would, "by constructing a residence without a chimney, set a good example to all the other unfortunate people who are obliged to live the year round either in London or its suburbs." Gas as it is at present sold, is good and cheap enough for this reformer, who wishes, in place of chimneys, to have "one main ventilating shaft;" and into this he would run the connecting-flues of all lights and stoves, as well as of his kitchener and therma. "If houses in the Metropolis were so constructed," he declares, "the smoke fog nuisance would cease to exist." He also maintains that a house so constructed would be not only the most convenient, but also the healthiest possible dwelling.

This proposition the writer proceeds to maintain through several pages of intelligent exposition and reasoning. Dealing with the question of lighting, Mr. D'Oyle admits that "gas fairly holds the sway in the field of illumination;" but he argues that "probably 90 per cent. of the burners now in use are faulty and extravagant." He makes a good point of the folly of people who, after spending a considerable sum on an elegant chandelier, are content to burn the gas itself through cheap and nasty burners, that waste at least one-half of the potential illuminating power of the gas. As to the use of gas for cooking, Mr. D'Oyle writes in terms of unstinted appreciation, citing the *Lancet* report in proof of his statements on this head, for the discomfiture of flippant, uninstructed reviewers. It is distinctly encouraging to find a member of the non-technical public so strong as Mr. D'Oyle is on the advantages of gas for heating bath water, and also as stalwart in denouncing that time-honoured fraud the open coal-fire. We are gratified also to discover that Mr. D'Oyle is at one with the Journal, in condemning the slovenliness of language and lack of system which marred the *Lancet* report on gas-fires and heating-stoves; and note that he has found out a few more shortcomings in this pretentious statement. He admits, however, that the intention of our medical contemporary was good; and confesses that it performed a useful service in recommending gas as fuel to the public. There is a good deal in Mr. D'Oyle's remarks upon gas-fires which makers of these goods would do well to study. It would not be fair to the writer or his publishers for us to reproduce these portions of the article; and therefore we must refer readers curious upon the subject to procure the original for themselves. We will say, however, that, while we are unable to agree with everything that Mr. D'Oyle has to say with regard to his ideal of house warming by gas, he has a closer grip of the matter than any other popular writer we have yet come across. The Journal is no stranger to him; and he has profited well by our hints upon a variety of matters of importance to the gas user. Finally, Mr. D'Oyle adds his own to the many blessings that have been bestowed upon the automatic prepayment meter system. Not the least sensible part of his article is its concluding paragraph, pointing out that in this matter of dealing with the smoke nuisance, while all manner of wild schemes have been advanced which could only be promoted, if intrinsically feasible, by drastic legislation, the real and only cure "has not only been with us, but has been growing unostentatiously in our midst, and only needs really bringing into greater prominence, to work out our salvation." This remedy is gas—not of some unattainable blend of quality and extreme low price, but as it is actually sold in London to-day. We thank thee, Mr. D'Oyle, for this thy testimony. It is much that the truth of the matter has at

length reached the magazines. Eventually, it will reach the better-class newspapers; and finally, the average man will get to know and appreciate it. Meanwhile, let us be thankful that the knowledge of gas is on its travels.

NOTES.

The Cause of Kitchen Boiler Explosions.

An instructive and at the same time amusing controversy has lately occupied the columns of our contemporaries the *Lancet* and *Engineering* on the well-worn subject of the cause of explosions of kitchen boilers. It is the habit of the former journal to occasionally unbend a little from its strict medical preoccupations, and to shed the light of the wisdom of "the faculty" upon matters of passing interest. In this style it recently undertook to instruct the world on the subject of the merits of gas-stoves for cooking and heating; and in the same way it took up the question of kitchen boiler explosions, which it attributed to the "sudden access of cold water into a red-hot receptacle." Thereupon *Engineering* ventured to remark that this notorious old theory of boiler explosions had been been itself definitively exploded by crucial experiment. Nothing daunted, the *Lancet* referred to Professor Everett's edition of Deschanel's "Natural Philosophy," in which it is stated that an explosive generation of steam may be caused by turning water into a boiler that has been allowed to become overheated. By way of rejoinder to this statement of opinion, *Engineering* reprinted the crucial experiments on kitchen and other boilers, made by Mr. Lavington E. Fletcher, which demonstrated once for all that there is not sufficient heat stored up in the metal of any boiler, in any conceivable circumstances, to produce the traditional effect; and that the old bugbear connected with the spheroidal condition of the water in an overheated boiler, supposed to result in the whole quantity of water flashing into steam instantaneously at a certain temperature, can also be dismissed without further regard. The important practical issue of the experiments in question can hardly be repeated too often, or be too strongly emphasized, seeing that it goes to show that the generation of steam in a boiler never takes places with explosive violence, and hence a safety-valve of suitable design is a perfect guarantee of safety. In other words, the region of mystery formerly surrounding explosions of kitchen and other boilers, and often utilized by makers and owners with the object of escaping responsibility for accidents, has been reduced almost to nothingness.

The Pressure Exerted in Cold Riveting.

In connection with a discussion at a meeting of the Engineers' Club of Philadelphia, on the subject of the riveting pressures required for structural iron and steel work, it was stated that Messrs. William Sellers and Co., had made a number of experiments with a view to ascertaining the pressure required for closing cold rivets of ⅞-inch section, such as are often employed in gasholder work. Many such rivets were subjected to pressures of from 10,000 to 60,000 lbs. At the lowest pressure—10,000 lbs.—the rivets merely swelled and filled the hole without forming a head. At a pressure of 20,000 lbs., the head was formed, and the plates were slightly pinched. At 30,000 lbs., the rivet was well set up. At 40,000 lbs., the metal in the plate surrounding the hole began to stretch; and this stretching became more and more apparent as the pressure went up to 50,000 and 60,000 lbs. From these experiments, the conclusion might be drawn that the pressure required for cold riveting is about 300,000 lbs. per square inch of rivet section. This statement illustrates the reason why ⅞-inch rivets are the largest ever riveted cold, in ordinary practice; and even these are not now employed so frequently as was formerly the case.

A New Compound of Sulphur and Carbon.

The isolation of a new liquid sulphide of carbon, of the composition C_3S_2 is announced by Professor von Lengyel, of the Buda-Pesth University. In addition to the well-known, and by gas manufacturers disliked, carbon disulphide, several other substances supposed to be compounds of carbon and sulphur have from time to time been described; but as they appear to have been amorphous insoluble solids, very difficult to purify, there is little evidence of their being definite compounds. The substance now described, however, seems to be a very well-characterized liquid compound of unmistakeable odour and corrosive action upon the skin, and capable of being distilled under diminished pressure. The method of preparing it was accidentally discovered during the elaboration of a number of lecture experiments illustrating the synthesis and decomposition of carbon disulphide. It was long ago pointed out by Berthelot that this substance is decomposed at a temperature but slightly higher than that at which it is formed; and this fact was once suggested as offering a means of eliminating it from coal gas. At Buda-Besth, carbon disulphide was dissociated by heat, and the vapours subjected to the high temperature of the electric arc, when the new sulphide of carbon was unexpectedly produced. The presence of something unusual was detected by the prevalence of an extraordinarily strong tear-exciting odour in the neighbourhood of the apparatus. Eventually a few cubic centimetres of a deep red liquid—the new sulphide of carbon—were left in the experimental apparatus. This fluid was found to possess the odour in great intensity, while a drop of it at once blackened the skin. The specific gravity of this liquid is 1·2739; so that it sinks under water, with which it does not mix. The fluid polymerizes by heat into a hard black substance, which it also assumes if left to itself for a few weeks. When heated, this black substance undergoes a remarkable change—sulphur subliming out of it, and a gas, inflammable and containing sulphur, but not carbon disulphide, is liberated. The nature of the gas is reserved for a further communication. The liquid sulphide combines readily with bromine; when the remarkable result is produced of a pleasantly odorous aromatic compound. The fact of two substances frightfully malodorous uniting to form an agreeably scented compound, is a striking example of the effect of chemical combination.

Death of M. Alfred Solvay.—The death is announced of M. Alfred Solvay, the founder and chief Director of the Société Solvay et Cie. The sad event took place at Nice, in his 55th year.

Professor Lewes's Lectures on the Chemical Technology of Coal Gas.—In another part of the JOURNAL to-day will be found a report of the fourth of the series of lectures on the above subject now in course of delivery by Professor Vivian B. Lewes, F.I.C., F.C.S., at the Stratford Town Hall. To-night the subject of the enrichment of coal gas will be taken up; and next Tuesday its consumption for the generation of light will be considered. In this lecture, the structure of flame and the various forms of burners will be explained; and it will close with some remarks on Professor Smithells's experiments. The concluding lecture of the course will be given on the 6th prox., when the methods by which the illuminating value of a flame is determined will be discussed, and some observations offered on the testing of gas for impurities.

The Welsbach Incandescent Burner.—The General Manager of the Incandescent Gas-Light Company, Limited (Mr. Julius Moeller) writes in reference to the figures as to the illuminating power of the Welsbach incandescent gas-light given in the JOURNAL for the 6th inst. (p. 239). He says the words "new mantle," which are put in parentheses in connection with the Welsbach incandescent burner No. 2, would lead a reader to infer that a mantle such as is manufactured and used at the present day had been employed in the photometrical tests alluded to. This, however, he points out, could not be the case, as, with the new mantles which have been in very general use during the past six months, and a pressure of ¾ to 1 inch and a consumption of 3½ cubic feet of gas per hour, a minimum of 60 candles can be easily obtained; whereas, with a better pressure, an illuminating power up to 70 candles, or even higher, is possible. Consequently, the best results obtained with the Welsbach light are not from 7 to 10 candles per cubic foot of gas consumed, but range from 17 to 20 candles. We may explain that the figures referred to were not the results of our own tests, but of those made by Messrs. Haycraft, Weightman, and Gawthorp, of the City and Guilds of London Institute, in connection with their investigations into the question of the "Photometry of Gas-Burners;" and these were, no doubt, carried out before the introduction of the latest make of mantle, which is giving the good results stated by Mr. Moeller.

Books Received.—"The *Electrician* Electrical Trades' Directory and Handbook for 1894." (*Electrician* Offices, Salisbury Court, Fleet Street, E.C.) A most useful book of reference for all who are interested in electric lighting. The work has reached its twelfth year; and each section of the present edition—the Handbook, Directorial, and Biographical—has been revised and brought up to date. The work contains a valuable folding table, specially prepared for the "Directory," giving particulars of the central lighting stations in operation or in progress in London and the provinces.——"Sell's Directory of Registered Telegraphic Addresses." (Henry Sell, 167, Fleet Street, E.C.) This is the eighth annual issue of Mr. Sell's "Directory;" and it has increased considerably in bulk as compared with its immediate predecessors. After much agitation, Mr. Sell has at length secured the co-operation of the Post Office authorities; and his book is now produced from lists supplied by them. It contains the names of upwards of 40,000 of the best firms; and also a list of large commercial houses, &c., and a gazetteer of the leading towns in the kingdom. The value of a telegraphic address is unquestionable; and a book which shows it at a glance should find a place in every office.——"Heating by Hot Water." By Walter Jones, of Stourbridge. (London: Crosby Lockwood and Son, Stationers' Hall Court.) This is the second edition of Mr. Jones's useful book, the first edition of which was noticed in the JOURNAL at the time of its appearance about four years ago. The letterpress has been extended by 100 pages, the tables have been revised, and some new ones introduced. Several articles on high and low pressure heating, radiators, duplicate boilers, hot-water supply, &c., which are included in the text, have not been published before in any book on the subject treated by the author. Mr. Jones presents in a convenient form a large amount of information on the best methods of heating public, private, and horticultural buildings; the matter being illustrated by 96 engravings.

TECHNICAL RECORD.

THE ACTION OF HEAT UPON ETHYLENE.

By Professor VIVIAN B. LEWES, F.I.C., F.C.S.

[A Paper communicated to the Royal Society, through Professor Thorpe, and read by the Author on Feb. 1, 1894.]

The decompositions of the simpler forms of hydrocarbons at an elevated temperature have always been recognized as a question of the greatest importance, as upon them is dependent a true conception of many of the actions taking place in the manufacture of coal gas and other kindred processes of destructive distillation. Ethylene has in most cases been chosen as the hydrocarbon which would lend itself most readily to experimental researches upon this point, as, besides being one of the simplest, it is easily prepared, and is, moreover, found as one of the products in nearly all cases where organic compounds are subjected to distillation at high temperatures.

No sooner had the difference between ethylene and methane been recognized, than experiments were made by Deimann, Van Troostwyk, Lauwerenburg, and Bondt* to ascertain the action of heat upon the newly-formed compound; and the conclusions to which they came were that on heating no contraction in volume was observed, but that the tubes in which the decomposition was effected became coated with a black deposit, and drops of an oily body were formed—the gas at the same time losing its property of forming an oily liquid with chlorine.

These experiments were afterwards repeated by Fourcroy, Hecht, and Vanquelin,† who showed that, when heated, ethylene yields hydrogen with deposition of carbon; while in 1805, William Henry‡ showed that ethylene was formed during the destructive distillation of organic bodies, and that, on further heating the gas, other changes were observed, and the gas was eventually converted into carbon and hydrogen. The deposition of carbon was also noticed later by Quet,§ who, on passing sparks through ethylene, found that carbon was deposited, and formed a bridge between the poles used for the discharge; while Dalton showed, by the continuous action of the electric spark, that ethylene yielded double its own volume of hydrogen—carbon being deposited.

Marchand‖ came to the conclusion that at a red heat this gas splits up into methane and carbon, but at a white heat into carbon and nearly pure hydrogen; while Magnus, in 1847, made the important observation that, on leading ethylene through a red-hot tube, a contraction in volume followed. The residual gas consisted of methane, hydrogen, and unchanged ethylene; while carbon was deposited, and fluid and even solid hydrocarbons were obtained.

In 1860, H. Buff and A. W. Hofmann¶ published a paper on the "Dissociation of Gaseous Compounds on Heating by Electricity." They found that, when a platinum spiral is heated by the galvanic current in pure ethylene, there is at once a visible separation of carbon, which covers the sides of the tubes with a black deposit, while hardly any expansion in the volume of the gas takes place, from which they assume that the ethylene has split up into methane and carbon. If the action on the gas, due to the incandescent platinum wire, is allowed to continue, then an increased amount of the gas undergoes dissociation; and soon after the separation of carbon commenced, they observed an expansion which is rapid at first, and in ten minutes reaches a maximum. Similar phenomena were noticed with the spark current. At first the spark had a pale reddish tint, which gradually turned to violet—immediate separation of carbon taking place; the spark being frequently stopped by scales of carbon which formed a bridge between the poles. They found that, under these conditions, the volume of gas expands very rapidly at first, but afterwards more slowly, and that after 20 to 25 minutes the point of maximum expansion is reached; so that 7 c.c. of dry ethylene gave, after decomposition, 12.25 c.c. They noted also that the residual hydrogen had an unpleasant smell, and burnt with a slightly luminous flame.

Berthelot,** in 1869, claimed that ethylene breaks up, under the influence of heat, into acetylene and hydrogen, as expressed by the equation—

$$C_2H_4 = C_2H_2 + H_2;$$

and he shows that the acetylene then polymerizes into benzene, styrene, and other liquid products of higher boiling-points. Naphthalene was also formed by the direct condensation of styrene and acetylene. He also points out that during the heating of ethylene a large proportion of ethane was formed; and his final conclusion is that the heating of ethylene results in the splitting up of 2 molecules of ethylene into acetylene and ethane, and that the formation of solid and liquid products is due to the subsequent condensation of the acetylene.

In 1886,* Day made a number of experiments in order to determine the lowest point of temperature at which the constitution of ethylene undergoes alteration, and the nature of the changes taking place at that temperature. In order to do this, he devised an ingenious apparatus in which the ethylene could be heated for very long periods in a hard glass tube. From these experiments he concluded that, when the action is continued over a long period, the gas undergoes change at much lower temperatures than had been previously observed. The alteration in constitution commences at about 350° C., at which temperature the change is one of condensation without the formation of members of any series of hydrocarbons having a percentage of hydrogen and carbon different from ethylene; while, if ethylene is maintained at 400° for a sufficient length of time, it is entirely decomposed—marsh gas, ethane, and liquid products being obtained.

In the same year, Messrs. Morton and Noyes† made an elaborate investigation, with the object of determining whether crotonylene (C_4H_4), which is present in small quantities in illuminating gas and other products of the distillation of organic matter, is formed as a primary product of decomposition by heat, or as a secondary product of the action of heat upon ethylene. Coal gas was passed slowly through a hard glass tube, 15 mm. in diameter, which was maintained at a low red heat for a distance of 60 centimetres. The products issuing from this tube were first passed through a series of U-tubes surrounded by a freezing mixture; the products which were not condensed were sent through an ammoniacal solution of cuprous chloride, to absorb hydrocarbons of the acetylene series; while samples of the gases escaping absorption were finally collected over water. Carbon was deposited in the decomposition tube. At the end of one month, 15 c.c. of liquid had been slowly condensed in the U-tubes; and in this liquid they detected benzene, naphthalene, anthracene, and some other aromatic hydrocarbons, present in quantities too small for determination. Faint traces only of precipitate were found in the ammoniacal cuprous chloride solution; while among the bodies absorbed by bromine they identified crotonylene, tetrabromide, and the gas collected over water proved to be a mixture of methane and ethane. The absence of acetylene from the products obtained led them to the view that these products are formed directly by the action of heat upon ethylene.

From the work of the earlier observers, the text-books have accepted the equation—

$$(1)\quad C_2H_4 = C_2 + 2H_2$$

as representing the decomposition which takes place at a very high temperature; while, on the evidence of the work done by Marchand, and Buff and Hoffmann, they represent the change taking place at a lower temperature by the equation—

$$(2)\quad C_2H_4 = C + CH_4.$$

During my attempts to trace the actions taking place in the inner zone of luminous flames, I was struck by the complexity of the changes, and the absence of any evidence which would tend to confirm the second equation; and I have made the experiments detailed in this paper in the hope of being able to trace the decomposition effected by heat in such simple hydrocarbons as ethylene, ethane, and methane.

The first step was to make experiments to corroborate the statement made by Day that, if ethylene is heated at 400° C. for a sufficient length of time, it is entirely decomposed, with formation of methane, ethane, and liquid products. In order to do this, an apparatus of the form used by Day in his experiments was employed; the only difference being that, instead of using an air thermometer, the temperature was taken by means of a platinum and platinum-rhodium couple, as introduced by Le Chatelier and fully described by Mr. C. Roberts-Austen, which had been previously carefully calibrated, employing salts of known fusing-points. The ethylene was prepared for this and for all the following experiments by making a mixture of 25 parts by weight of rectified methylated spirit and 150 parts of strong sulphuric acid. The mixture was heated in a flask containing a layer of sand; and the gas evolved was washed by contact with strong sulphuric acid, and by passage through several bottles containing a strong solution of caustic soda. The gas was stored in a glass gasholder for several days over water containing sodic pyrogallate and sodic hydrate, to absorb all traces of oxygen. On analysis, it gave—

	Per Cent.
Ethylene	98·80
Nitrogen	1·20

The gas was then passed through the combustion-tube, until it was considered that all air had been displaced; and the tube was maintained for 100 hours at 400° C. Oil and a very small quantity of carbon deposited in the tube; and the volume decreased from 100 to 61. The gas was then removed from the tube, and analyzed.

In all the analyses described in this paper, the following procedure was adopted: Carbon dioxide was absorbed by means of a 50 per cent. solution of sodic hydrate, the oxygen estimated by absorption with alkaline pyrogallate, and the unsaturated hydrocarbons next absorbed by means of a solution of bromine in potassium bromide (care being taken to remove bromine vapour from the gas by agitation with caustic soda before measurement). The carbon monoxide was next estimated by

* *Annales de Chimie et de Physique*, First Series, Vol. XXI., p. 48.
† Gilbert's *Annalen*, Vol. II., p. 210.
‡ "*Nicholson's Journal*," 1805.
§ *Comptes Rendus*, Vol. XLII., p. 903.
‖ *Journal für Prakt. Chem.*, Vol. XXVI., p. 478.
¶ Liebig's *Annalen der Chemie*, Vol. CXIII., p. 119.
** *Annales de Chimie et de Physique*, Fourth Series, Vol. XVI., p. 144.

* *American Chem. Journal*, Vol. VIII., p. 153. † *Ibid.*, Vol. VIII., p. 362.

acid cuprous chloride; and, after removal of acid fumes, the residual gas was treated with paraffin oil, previously prepared for use by heating over a water-bath for at least an hour.

Experiments show that, in the case of mixtures of methane with higher members of the same group, agitation with paraffin prepared in this way, or mere standing in contact with it, with occasional agitation, for 20 to 30 minutes, will remove the ethane and any higher saturated hydrocarbons that may be present, together with a small proportion of the methane. The amount of residual methane can then be determined by explosion with oxygen, and subsequent estimation of the carbon dioxide formed; the volume of gas absorbed by the paraffin *plus* the volume resulting from explosion giving the total volume of saturated hydrocarbons. Details of the results obtained by this method of procedure when dealing with gaseous mixtures of known composition will be found in the *Journal of the Society of Chemical Industry*, Vol. X., p. 407.

The analysis of the heated ethylene gave—

	Per Cent.	
Carbon dioxide	0·82	
Oxygen	0·00	
Unsaturated hydrocarbons	7·00	
Carbon monoxide	1·17	
Saturated hydrocarbons—		
Paraffin	40·18	61·82
Explosion	21·64	
Hydrogen	22·18	
Nitrogen	7·01	
	100·00	

The oxides of carbon and increase in the nitrogen show that some air had remained in the tube.

A second analysis was now made; but instead of estimating the saturated hydrocarbons by first absorbing the higher members and some methane by paraffin, they were exploded with oxygen. The methane, calculated from the carbon dioxide, amounted to 112·5 per cent.; showing that ethane and probably even higher members of the series were present. These results fully bear out the statement made by Day as to the decomposition of the ethylene taking place at a temperature of 400° C., and also those made by Berthelot and by Day, that, under the conditions of this experiment, ethane, or at any rate higher members of the C_nH_{2n+2} series are formed as well as methane.

It would, however, be manifestly wrong to assume that the formation of the higher paraffins was a primary action; as keeping the hydrocarbons formed by the primary changes at a temperature of 400° C. might easily lead to the formation of secondary products by interaction between the gases. It seemed much more probable that the character of the primary decompositions would be ascertained by rapidly heating the gas, and as rapidly removing the products of decomposition from the influence of heat, and that this would be effected by passing a regular current of the gas through a very narrow tube heated for a distance of 140 mm. to a known temperature.

The necessity for heating this tube to temperatures above 1000° C. practically limited the choice of material of which it could be made to fire-clay or platinum. It was at first feared that the use of the latter might interfere with the changes taking place; but a long series of comparative experiments, in which ethylene was decomposed by passing through (*a*) a pipe-stem glazed with borax, and (*b*) a platinum tube 2 mm. in diameter, both being heated to the same temperature, showed that the platinum tube was free from experimental objection, unless a considerable percentage of oxygen was present, and that, even with a new tube, the decompositions were of the same nature as when the pipe-stem was employed.

Under these conditions, the platinum tube possessed so many advantages over the clay pipe that, in all the subsequent experiments, a platinum tube, 2 mm. in diameter and about 40 cm. in length, was used. In order to accurately measure the temperature to which the gas in the tube was heated, the following arrangement was devised: Ethylene was stored in a gasholder, and, after passing over calcic chloride to dry it, entered the platinum tube. In this tube the platinum and the platinum-rhodium thermo-couple were arranged in the following fashion: The two wires are twisted together for a length of 3 mm., and the wires on either side of the twist are then passed through thin glass tubes, which are fused on to them. Having been in this way coated with glass, so that only the twist is exposed, they are passed through the platinum-tube—the glass insulating the wire from the tube, and also keeping the thermo-junction in such a position that it registers the temperature of the gas in the tube, not that of the wall of the tube. To each end of the platinum tube, glass T-pieces are fitted, down the stems of which the wires pass to mercury seals. From the metal seals, conducting wires lead to the resistance coils, the key, and a reflecting galvanometer. The products, after leaving the platinum tube, pass through a U-tube, cooled in ice and salt in order to condense any liquids, then through a collecting tube, from which the sample of gas for analysis is taken, and thence to Volhard absorption-flasks, containing ammoniacal silver nitrate for the estimation of acetylene; the flow of gas through the apparatus being regulated by means of the aspirator bottle.

(To be continued.)

Mr. J. Lawry, of the Falmouth Gas-Works, has lately been appointed Manager of the Gunnislake Gas-Works.

SOUTHERN DISTRICT ASSOCIATION OF GAS ENGINEERS AND MANAGERS.

Annual Meeting in London.

The Annual Meeting of this Association was held last Thursday, at the Holborn Restaurant, High Holborn. At the commencement of the proceedings, the chair was occupied by the retiring President, Mr. C. C. Carpenter, the Engineer of the Vauxhall works of the South Metropolitan Gas Company.

Mr. Carpenter said it was his pleasing duty to introduce to the members the President for the ensuing year—Mr. H. Smythe, of Maidstone—and he need hardly express the hope that they would extend the same kindness and generosity to Mr. Smythe during his term of office that they had done to him.

The President having taken the chair, the following formal business was transacted.

Annual Report.

The Hon. Secretary (Mr. J. W. Helps, of Croydon) read the Committee's report for 1893, as follows:—

In presenting the eighteenth annual report of the Association, the Committee feel that the events of the year under review have not been behind those of previous years in point of interest and usefulness to the members generally.

The usual meetings have been held during the year—viz., on the 9th of February, the 25th of May, and the 23rd of November.

At the February meeting, the Inaugural Address of the President (Mr. C. C. Carpenter) was given—an address dealing with subjects of the greatest interest to the gas profession, treated in a manner which left nothing to be desired. At the conclusion of the address, a presentation of an interesting nature took place—the recipient being the valued Honorary Secretary of the Association. The presentation, which was made by the President in a few well-chosen sentences, took the form of a gold watch, subscribed for by the members as a slight mark of their high appreciation of the services rendered by Mr. Helps. The Committee here take the opportunity of again expressing their sense of the indebtedness of the Association to Mr. Helps for the willing assistance rendered by him on all occasions.

The meeting of the 25th of May took place at the Vauxhall works of the South Metropolitan Gas Company, by invitation of Mr. Carpenter, the Engineer of the works; and the visit was one of the deepest interest—the works bearing in every part the impress of the painstaking methods and scientific mind of the Engineer in charge. After the inspection of the works, an adjournment was made to the gasholder station at Kennington Lane, where an excellent luncheon, provided through the kindness of the Directors of the South Metropolitan Gas Company, terminated the first portion of the day's proceedings. The members subsequently journeyed together by train to Hampton Court; and, by special permission of Her Majesty's First Commissioner of Works, were conducted over the Palace, including portions of a highly interesting character not usually accessible to visitors.

At the meeting of the 23rd of November, a large number of members and visitors assembled to hear the valuable and interesting paper on oxy-oil gas, presented by Dr. Thorne. The interest taken in the subject was fully evinced by the discussion which took place after the reading of the paper.

On the subject of papers, it is not one of the least arduous of the duties of the Honorary Secretary to induce gentlemen to come forward and give the benefit of their experience in the form of a contribution to the literature of the Association; and the Committee would urge upon the members generally the desirability of assistance in this matter.

Two members of Committee, Messrs. G. Lane, of Aylesbury, and J. C. Watson, of Sydenham, having retired by rotation, their places have been filled by Messrs. J. Thorman, of West Ham, and W. Walker, of Worthing.

The funds of the Association continue in a satisfactory condition. The receipts for the year amounted to £51 12s. 9d.; the expenditure being £45 6s. 2d.—leaving a balance carried forward of £50 12s. 10d., as against £44 6s. 3d. in the previous year.

The bound volumes of Reports of District Associations will again be forwarded to each member.

On the motion of Mr. W. H. H. Broadberry (Tottenham), seconded by Mr. R. Herring (Dover), the report was adopted.

Thanks to the Ex-President.

The President said it was now his pleasing duty to propose a vote of thanks to the retiring President. The members would agree with him that Mr. Carpenter had filled the chair with conspicuous ability during the past year; and he had done all he could to promote the success of the Association. He (the President) had, therefore, much satisfaction in moving that the best thanks of the members be given to him for the manner in which he had discharged the duties of the office.

Mr. C. Gandon (Lower Sydenham) seconded the proposition with great pleasure, because he was sure, during the time he had been in the chair, Mr. Carpenter had fulfilled all those high expectations that they held concerning him when they elected him. The Committee's report commenced by saying: "The events of the year under review have not been behind those of previous years in point of interest and usefulness to the members generally." Certainly they had not; and, to a great extent, they had to thank their retiring President for the success which had attended them.

Mr. Carpenter said he need hardly say it was a matter of great gratification to him to hear such kind words from those gentlemen whom the members had, if he might say so, made their mouthpieces. When he first joined the Association, it was not with the least hope or idea that he would ever become its President. But since he had that honour thrust (he might

almost say) upon him, it was natural he should endeavour to fulfil the duties to the best of his ability; and if he had succeeded—as the members said he had—that was the greatest reward he could wish or hope for.

The PRESIDENT then read the following,

INAUGURAL ADDRESS.

Gentlemen,—I take this, my first, opportunity of addressing you from the chair, to thank you for the honour you have conferred upon me in electing me your President for this year.

In preparing this address, I have encountered the difficulty, frequently experienced by gentlemen in my position, of finding matter of sufficient novelty and importance on which to address you. I have therefore ventured to follow the example of some of the able gentlemen who have preceded me in this office, by giving you a brief account of my recent practice and experience as the Engineer of a provincial gas-works; and in doing this, I hope, by touching on one or two topics of current interest, to make the address to some extent worthy of your attention.

The amount of coal which it is desirable for a gas company to keep in stock has lately become a question of much importance to us. Not many years ago, it would have been considered very unnecessary for a gas-works to have storeage for its raw material equal to one-third of its year's requirements. But such is now the case at Maidstone, with its coal-stores of 6000 tons capacity, to meet an annual requirement of 18,000 tons; and recent events have proved not only the desirability, but the great necessity there is for having such large storeage room in works so far distant from the pits as these are. By keeping these stores full in winter and about half full in summer, it ensures a three months' supply of coal in the event of any stoppage of deliveries taking place owing to strikes or other causes; and, as a matter of fact, the prolonged coal strike which happened about two years ago was passed through without causing any difficulty in keeping up the continuously full supply of gas on which so many people now depend, and without causing any loss through having to buy coal *ex* contract at inflated prices.

The storeage of large quantities of coal is, of course, attended with risk from fire by spontaneous combustion; but this, I think, may be prevented to a great extent by taking certain precautions, the principal of which would be to avoid storing damp coal for any length of time. In fact, any coal received in a damp condition should, if possible, be used up at once. And by frequently testing the temperature of the coal as it lies in the stores, and by watching for the pungent smell which proceeds from heated coal, combustion may be detected and stopped before it has had time to do much harm. In the matter of depreciation, I have found that coal stored under cover for a twelvemonth does not suffer to any appreciable extent; but I fear this would not be the case with coal stacked in the open. At Maidstone, as elsewhere, occasional instances of spontaneous combustion in the coal heaps have occurred; and these have always been traced to dampness in the coal. But one case, which resulted in a rather serious fire, is, from its cause, perhaps worthy of being mentioned. The coal on this occasion was in store to the height of 16 feet; and it had all to be removed before the point of combustion, which was at the bottom of the heap next the floor, could be discovered. Here it was found that water was oozing into the coal through the wall from a broken surface drain outside the store; thus leaving no doubt as to the cause of the combustion. Since this occurred, the usual ventilators have been fixed at intervals throughout the coal-stores. These are one foot square, made of timber; and though their value as ventilators is doubtful, they can, by periodical testing with a thermometer, be made useful in getting an indication of any heating which may be taking place in any part of the stores.

At these works, the greater part of the coal is now being carbonized in a new retort-house, 150 feet long and 70 feet wide, just completed, but having at present only half the retorts it is capable of containing. This house is constructed on the stage-floor principle; and the retorts, which are 22 in. by 16 in. and 21 feet long, ⌂ section, set in beds of eight, are heated by a very simple and effective form of regenerator furnace designed by Mr. John West, one of our esteemed Past-Presidents. The construction of this house, it need hardly be said, has involved a considerable expenditure of capital, which cannot be fully utilized for some time to come; but a return for this outlay is looked for in the economies to be obtained from the application of the regenerative system to the heating of the retorts. These economies will be twofold—the first, and more important, consisting in a large saving of fuel;* and the second, in the greater duration of the retorts and furnaces. The new hydraulic and foul mains rest on the steel cross girders which form the ties to the side buckstaves, and are thus little affected by the expansion and contraction of the brickwork of the retort-bench.

Each hydraulic main is fitted with one of West's tar and liquor valves, which is in reality two valves combined in one. The upper valve, which forms the gas-outlet, has a dash-plate cast on one side of it. This projects inside the hydraulic main, and (owing to the difference in their densities) causes the bulk of the tar to run off before the liquor, thereby maintaining a fairly light seal on the dips. The lower valve is for the purpose of occasionally running off the thick tar from the bottom of the main. The hydraulic mains in the old retort-house, by the way, are fitted with false bottoms, as recommended by Mr. George Livesey some years ago; and I can testify also to the efficiency of this simple method of maintaining a light seal on the dips. The custom which prevails at Maidstone, of working the retorts at a high temperature, has long since determined the necessity of separating the tar from the gas as quickly as possible. This is done by having a small independent main running under the foul-gas main, and connected to it at intervals by branches, each provided with a valve, until it reaches the condenser. By this means, it has been found that deterioration of the quality of the gas and deposits of thick tar in the foul mains are prevented—the former to a great extent, and the latter entirely.

It was at these works, as most of you know, that Mr. West designed and perfected his well-known manual retort charging and drawing appliances, as well as his coal breaking and elevating machinery; and the installation of this plant (which the Association inspected at Maidstone 15 years ago) is still to be seen doing good work. The most noticeable feature in the recent installation of this apparatus in the new retort-house is the greater strength of the material used in its construction. Otherwise the design is practically the same as in the older installation; thus proving, after fifteen years' practical experience with it, that there was little room left for improvement on the original design. The economy of labour and the increased yield of gas which have been obtained since the introduction of stoking machinery at these works have been most marked; and they account largely for the low price at which gas is sold there. Like many others who have had experience of it, I cannot speak too highly of these valuable appliances; and I think no better could be wished for in any moderate-sized gas-works. A special feature of the new West apparatus at Maidstone is the coal-conveyor, consisting of an endless belt 15 inches wide, which runs on concave rollers, secured to a light iron frame. This is fixed in the roof of the retort-house, and carries the coal from the elevator on one side of the house to the fixed hopper on the other; the driving power being obtained from the coal-breaking engine in the coal-store below.

A process of gas enrichment with oil—which claims also to be a means of dissolving and preventing the formation of naphthalene in the mains and services—was adopted at these works in July last; but more on account of its latter than its former property, although the stoppage of the coal-pits, which happened soon after its introduction, greatly increased its value as an enricher. The process is the one which was introduced by Mr. Herring, senr., and which has been in successful use for some considerable time at the Dover Gas-Works. It consists in the injection of petroleum oil into the retort, under an average pressure of 40 lbs. to the square inch. The oil used has a specific gravity of ·800, and cost 4½d. per gallon on the works; and my experience has so far shown that three-quarters of a gallon of it to every ton of coal carbonized will take the place of about 5 per cent. of Midland cannel formerly employed to maintain the illuminating power of the gas at a minimum of 15½ candles. This makes the cost of enrichment about one halfpenny per 1000 cubic feet; and if we consider the additional value of the coke made from the coal used instead of cannel, it will be seen that a considerable economy is obtained by the use of oil for this purpose. With regard to the solvent property of the oil gas, a more lengthened experience of it would be required to enable me to speak definitely on this point; but the comparative freedom so far obtained from obstruction by naphthalene in the mains between the exhausters and the purifiers, would indicate an improvement in this respect which I think should also be placed to its credit. The gas made by this process has the advantage of being mixed with the hot coal gas, and of being slowly condensed with it; thereby, I think, adding to its chance of permanency. But the handling of the oil by stokers, and the intermittent system of carburetting which it involves, leave room, I consider, for some improvement. It might be done in a more satisfactory way by having as an adjunct to the retort-house an evaporating vessel, into which the oil would flow continuously from an underground storeage-tank, and, after gasification, be mixed with the hot gas in the foul main.

The exhausting plant at these works hardly calls for remark, except to mention the adoption some time ago of Messrs. Donkin's engine regulator in addition to the existing exhaust regulator with which to maintain a steady exhaust on the mains; also the application of sight-feed lubricators to both engines and exhausters, to procure an efficient and economical lubrication of all parts of the machinery, and the recent use of a jet photometer supplied with gas from the nearest foul main. From this photometer the engineman gets an immediate indication of the quality of the gas being made, and regulates his exhaust accordingly. I am, by the way, glad to see that Messrs. Sugg and Co. are now supplying a specially-made photometer for this purpose, as the ordinary apparatus is quite useless for the work.

The primary stages of the purification of gas at Maidstone take place in a horizontal water-condenser, two Livesey washers, and a "Standard" washer-scrubber; and these are so arranged that the ammoniacal liquor from the condenser and scrubber, together with that from the retort-house mains, gravitates to a

* The President remarked that since the address was written, he had found the saving of fuel to be as much as 15 per cent. on the old furnaces.

settling-tank, and thence to the washers; thereby avoiding the necessity for pumping it. Although each of these appliances was about the first of its kind that was used, and subsequent ones have been much improved, I am able to testify to their general efficiency. The temperature of the gas at the inlet of the condenser seldom exceeds 90° Fahr.; and this makes it an easy matter for this vessel to cool the gas very gradually to the temperature of the atmosphere. The washers thoroughly cleanse the gas from tar, and the scrubber frees it from ammonia; and they together leave only the following impurities to be dealt with by the purifiers proper—viz., about 2 per cent. of carbonic acid, 560 grains of sulphuretted hydrogen, and 31 grains of sulphur compounds. This apparatus, it may be mentioned, is all covered in by a light slated roof, which helps greatly to keep each part of it at that equable temperature that is so desirable for effective working.

There are three sets of purifiers, two of which consist of four boxes 24 feet square, and the third set of a similar number of boxes 14 feet square. The method of working these now, after trying various other plans which were not found to answer so well, is to pass the gas simultaneously through the two large sets, which are charged with lime, and each worked in rotation. The two streams of gas then unite, and pass through the small set, the first two of which are charged with lime, and the remainder with oxide of iron. The lime in this third set is made into sulphide of calcium, and remains active from six to nine months. It was found necessary to have this adjunct to the sulphide boxes in the larger sets, in order to keep the sulphur compounds in the purified gas at a steady 9 grains; also to enable the large boxes to be always in a condition for emptying, without the spent lime causing a serious nuisance.

A day's tests taken at the inlets and outlets of the respective sets of purifiers would be as follows; and these show that the first and best carbonated purifier in No. 2 set requires fresh charging and placing in position for being sulphided:—

	No. 1 Set.		*No. 2 Set.*		*No. 3 Set.*
	Inlet.	Outlet.	Inlet.	Outlet.	Outlet.
CO_2 . . .	2 p. ct.	Nil. ..	2 p. ct.	Nil. ..	Nil.
H_2S . . .	560 grs.	90 grs. ..	560 grs.	290 grs. ..	Nil.
CS_2. . . .	31 „	12 „ ..	31 „	15 „ ..	9 grs.

The causticity of the lime used averages 90 per cent.; and the spent lime is carbonated to about 60 per cent. Although the use of 2 per cent. of air admitted at the inlet of the exhausters necessitates the oxide being charged in thinner layers than before it was used, it is found to help greatly in the duration of the activity of the oxide.

The manipulation of purifiers, having special regard to the kind of valve most suitable for this purpose, might, I think, very well form the subject of a paper and discussion, if it has not lately done so. I am led to say this from my experience of the trouble and risk of accident attending the use of hydraulic valves for purifiers. They are slow in their action, and liable to get out of order through deposits of naphthalene and foul water; and in winter they require much attention to prevent their getting frozen. So that if the makers can now guarantee their faced valves to remain perfectly sound for a reasonable time, it would seem to give this form of valve the superior advantage that was once claimed for hydraulic valves in sulphur purification.

Before leaving this subject, I am tempted to speak of the excellent paper on "Purification" which was read before you a short time ago by my immediate predecessor in the chair. In that paper, Mr. Carpenter may be said to have given a review, "up to date," of the subject in all its bearings; and he especially showed, by his own experience, that the rotation system, combined with the use of air proportioned to the requirements of the various purifying vessels, gave the most satisfactory results in the elimination of the sulphur compounds.

Passing to the storeage accommodation for the gas, it is perhaps noteworthy that at Maidstone this only amounts to 640,000 cubic feet, to meet a maximum output of 1,000,000 cubic feet. This may seem to be insufficient, and likely to cause some loss and risk of accident through running short of gas. But, thanks to the large and ever-increasing day consumption which obtains there as in many other towns, there is not found to be much loss or risk from this apparently disproportionate amount of gas storeage. The consumption of gas from 6 a.m. to 6 p.m. sometimes exceeds that between 6 p.m. and 6 a.m.; but, taking it to be 500,000 cubic feet during each twelve hours, an average day's working in midwinter would be represented thus:—

	Make.	Stock.	Output.
6 a.m.	— ..	300,000 ..	—
12 midday	250,000 ..	400,000 ..	150,000
6 p.m.	250,000 ..	300,000 ..	350,000
12 midnight . . .	250,000 ..	150,000 ..	400,000
6 a.m.	250,000 ..	300,000 ..	100,000

These figures show that, with this limited storeage, a considerable margin is left for increase or decrease of stock; the reduced output of gas on Sundays being met by ceasing to work half the retorts for twelve hours on these days.

In the important matter of distribution, I quite agree with those who consider that it would be greatly to the advantage of consumers if the gas suppliers had control of their supply up to the point of combustion. If this were more generally the case than it now is, there would be fewer complaints about bad gas; and a better feeling would exist between consumers and suppliers. But there is another and more urgent form of complaint which I fear has been only too common with some of us, especially in winter. I refer to the case of the consumer who, when perhaps he is most in need of a good supply of gas, finds it suddenly cut off, thanks to the baleful influence of the weather on his supply-pipe. A short time ago, I had the honour of reading before this Association a paper on "Distribution,"* in which I advocated the use of comparatively large mains and services as a means of preventing stoppages from naphthalene. Since then, three winters have been passed through, the first of which was a very severe one, and caused many stoppages of supply in my district; but these were mostly found to be in small old services, and especially in pipes very much exposed, as they are in public lamps. However, there was a marked improvement in this respect during the recent severe weather of the present winter; and when the weather is in a normal condition, there are practically no stopped pipes. This I can only attribute to the beneficial effect of oil gas in preventing naphthalene deposits. So that it appears, from my own experience, and I believe from that of many others who are carburetting their gas with petroleum oil or spirit, that this source of annoyance to many of the consumers, and of loss to the suppliers, can be partially, if not wholly, prevented by this means. This, I think, is a fact on which we can congratulate ourselves; and it should go a long way to encourage the use of oil for gas-making.

The importance of having a staff of thoroughly qualified gas-fitters is now recognized by many gas companies, so that the requirements of their customers may be quickly and efficiently attended to; thereby preventing dissatisfaction, and helping to increase the popularity of gas for all its various uses. Of late years, the work in this department has greatly increased, as has also the number of different gas appliances, with all of which a good gas-fitter must be familiar. And more than ever is it necessary that he should be a skilful, intelligent, and civil workman, to be able to give satisfaction to the different classes of consumers in their several requirements. At Maidstone, besides ordinary gas-fitting, the fitter must be familiar with meters, public lamps, cooking-stoves, gas-fires, and other heating appliances, as well as with gas-engines; and recently prepayment meters have been added to the number. All this involves a large amount of work, which can only be done satisfactorily by experienced and careful workmen.

The quantity of gas sold in Maidstone per consumer is high; being 75,000 cubic feet per annum. But the number of consumers is low—being only 1 in 13 of the population; and only 2500 out of a total of about 6000 inhabited houses are supplied with gas. Now, as the price of gas for some years past has been the very low one of 2s. 5d. per 1000 cubic feet, it was evident, although less than half of the houses are supplied with gas, that the amount of consumption had nearly reached the "saturation point" under the old conditions of supply and payment. The circumstances were therefore considered favourable for the introduction of the prepayment meter system of supply. It was adopted, and has now been in use for several months, with encouraging results. The class of houses supplied are those for which a rent of about 7s. weekly is paid; and they are each fitted with a pendant, a bracket, and a boiling-ring, and, of course, a meter, from which so far an average of 3s. per month has been collected. This average consumption is not quite so much as was expected; but no doubt it will increase, as it has done to a very great extent with the older class of consumer. The supply of gas-fires on hire was only commenced at Maidstone a few years ago; and it has already helped greatly to increase the consumption of gas.

The hiring-out of gas cooking-stoves, however, has been a long-established custom there; and the desire to supply a thoroughly efficient and economical stove has led to practically the whole of the cooking-stoves being made on the works. The leading features of these stoves consist in having the ovens air jacketed and almost entirely closed at the bottom—an aperture being left only just large enough to admit sufficient air for the proper combustion of the gas; thus preventing the waste of heat which takes place in most other cooking-stoves. Secondly, the burners of the hot plate are removable; and the hot-plate itself is fitted so that it can be lifted up and easily cleaned in every part. Lastly, the stove is made of very light material, so as to be readily moved about, which is an important matter when we consider the number of changes the hiring-out system involves.

In this brief account of my experience, two matters are touched upon which I believe to be of more than usual interest to us at the present time. These are "the enrichment of gas by oil" and "the prepayment meter system of gas supply." From my own short experience of these, I have come to regard each of them as being an important departure in our industry, from which both gas consumer and gas purveyor are likely to derive considerable benefit. A substitute for cannel as an enricher of coal gas has long been desired, on account of its scarcity and dearness; and, judging from the fact that there are, I believe, very few members of this Association who are not using oil as an enricher, in one way or another, this substitute has been found in oil, thanks to the cheapness and good quality of the article which can now be obtained for this purpose. Many engineers, like myself, find that carburetting gas with oil produces considerable economy in the ways I have mentioned;

* See JOURNAL, Vol. LVI., p. 1089.

and as its extended use is sure to have a cheapening effect on the price of cannel, those who still resort to the latter as a gas enricher will, no doubt, likewise benefit by the innovation.

It is rather a curious coincidence that, while the use of oil is being largely adopted in gas-works, a system of gas supply should be offered to the public, one of the direct consequences of which will be to displace the domestic use of a large quantity of oil of the same quality as that used for gas-making purposes. This fact, by the way, should be reassuring to those who fear that its employment in gas-works will greatly increase the demand for oil, and thus soon cause it to rise in price. That oil is not a safe illuminant is only too well known, and that it is otherwise unsatisfactory for this purpose is, I think, abundantly proved by the eagerness with which the prepayment meter system is taken up. Now that gas is to be had on terms which will suit the poorest labourer, it is likely to become more than ever the working man's light; and I think the time will soon follow when the working man will find the great benefit of gas as a heating as well as a lighting agent. That the system will meet a great want is, I think, shown by the following expressions of opinion taken from the local press. One writer says that "its introduction will soon cause the dirt and danger proceeding from the use of oil-lamps to become a thing of the past;" and another that "it will be a great boon to the working class, and is sure to meet with an ever-increasing popularity." A member of this Association, who has had considerable experience of the system, has recently said that it seems to have a great fascination about it; some people who can well afford to fit up their own houses preferring to pay a higher price for the gas, so that they pay for it beforehand.

This new system of gas supply creates another field for the extension of gas which is by no means an unimportant one, as, although each new consumer may be a small one, the number of them is likely to be very large, especially in the towns which this Association represents, where, in many cases, the supply to a few public lamps is the only consumption obtained in whole streets of workmen's houses. That this should be so is, of course, largely owing to the unpopularity of quarterly accounts, and to the inability of the working class to meet the initial expense of having their dwellings fitted for gas. As a means of avoiding the necessity for deposits and of preventing bad debts, the prepayment meter might also be supplied to many old consumers, to their great convenience and to the benefit of the gas suppliers; and from this system of gas supply I think we may look for a greater amount of business than we are likely to lose by the introduction of electric lighting.

Gentlemen, I have endeavoured to give this short address that communicative character which, in its transactions, the founders considered so necessary for the success of this Association. For this reason I venture to hope that it will be, in some degree, acceptable to you, not excepting the many present who are possessed of much wider experience and a more progressive spirit than I can claim. When visiting the works in charge of members of this Association, I have always been impressed with the many signs of progress which are to be seen there, and with the benefit to be derived from this part of the Association's work, which I hope may not only continue but extend. Whatever may have been the case in the past, it is in fact abundantly evident that the gas engineer of the present day is keenly alive to the necessity of keeping himself acquainted with all new processes or methods of working connected with his industry which promise to give any economy on his present results, and of adopting them if, after investigation, they should be found to possess the advantages claimed for them, and if it should be practicable for him to do so. In this good work, I consider that this and kindred Gas Managers' Associations are a most important aid; and should the time come, as no doubt it soon will, when Committees of Investigation will be appointed to inquire into, and report upon, the value of novel methods and contrivances relating to our business, the usefulness of the Association will be greatly increased thereby. It may also be truly said that these Associations do much to foster an *esprit de corps* among their members, which cannot but benefit the industry they represent. The importance of this industry, and its stability as a sound, profit-bearing investment, are immensely increased when it is considered that the commodity which we manufacture and supply is a great source of heat and power as well as of light; and this position for it will not only be maintained but increased, so long as we continue to avail ourselves of every means of improving its quality and reducing its price.

Mr. W. D. CHILD (Romford) proposed a hearty vote of thanks to the President for his interesting address. At the opening, the President spoke of the difficulty of finding matter for an address; but they might congratulate him in having found so many topics of interest to gas manufacturers—such as coal storeage, carbonization, and the enrichment and storeage of gas. Mr. Smythe was a very old member of the Association; and he (the speaker) was sure that, during his term of office, he would receive the hearty support of every member.

Mr. T. MAY (Richmond) seconded the motion.

The PRESIDENT thanked the members for the kind way in which they had expressed their appreciation of his address.

The members with a few friends then dined together; and subsequently the customary toasts were honoured—the proceedings being enlivened by several well-rendered songs.

MIDLAND ASSOCIATION OF GAS MANAGERS.

Annual Meeting at Stourbridge.

The Seventeenth Annual Meeting of the Association was held last Thursday, under the presidency of Mr. R. O. PATERSON, of Cheltenham.

The great body of members and visitors to the meeting left Birmingham in saloon carriages attached to the 11.40 train from Snow Hill, reaching Stourbridge at about 12.30, where they were met by Mr. W. North, Engineer and Manager of the gas-works, and Mr. Walter Jones, Chairman of the Gas Committee of the Stourbridge Improvement Commissioners, who, it will be remembered, last year acquired the property of the old Stourbridge Gas Company under terms of an arbitration award. The Commissioners had granted the members the use of the Town Hall for the purpose of the meeting; and light refreshments were provided by them immediately on arrival.

On the President taking the chair, the minutes of the last meeting were read by the HON. SECRETARY (Mr. C. Meiklejohn, of Rugby), and approved as correct.

Two new members were elected—Mr. T. E. Maddocks, of Kettering, and Mr. W. G. Owen, of Ross.

The following report by the Committee of the Association (accompanied by a statement of accounts for the past year) was then submitted, and approved:—

The Committee have pleasure in submitting the following report for 1893. The annual meeting was held in the Grand Hotel, Birmingham, on Thursday, Feb. 16. The President (Mr. B. W. Smith, of Smethwick) delivered his Inaugural Address, dealing in a very practical and interesting manner with the main topics of interest to the present-day gas manufacturer; urging the strictest economy in every department, in order to counteract the increased cost of coals and labour and the reduction in residuals. In anticipation of the visit of the Association to the Smethwick Gas-Works in the afternoon, the President also gave a detailed account of the extensions carried out there during the past year. The members then adjourned to luncheon, after which they were conveyed in saloon carriages from Snow Hill (Great Western Railway) to Handsworth, where they visited the extensive premises of Tangyes Limited, over which they were conducted by Mr. Lincoln Tangye, Mr. Treglown, and Mr. Pinkey. This visit proved extremely interesting; the members being particularly interested in the gas-engine department. Before leaving, the members were entertained to tea by the firm. A visit was then made to the Smethwick Gas-Works (where the members were received by Mr. Newey, the Chairman of the Local Board, and Mr. Brooks, the Chairman of the Gas Committee), over which they were conducted by the President.

The spring meeting of the Association was held in Worcester, where, owing to the kindness and hospitality of the Directors of the Gas Company, and the complete arrangements made by Mr. Adlington, the Engineer, a most enjoyable day was spent. The business of the meeting was only of a routine character; and after the luncheon, which was presided over by Mr. J. Stallard, the Chairman of the Gas Company, supported by Alderman Buck, one of the Directors, the members visited the Royal Porcelain Works, enjoyed a trip on the Severn, and were subsequently entertained to "high tea" at the Hopmarket Hotel.

The autumn general meeting was held at the Grand Hotel, Birmingham, on Thursday, Oct. 26, 1893. The following officers were elected for the ensuing year: President, Mr. R. O. Paterson, Cheltenham. Vice-President, Mr. G. Winstanley, Coventry. Honorary Treasurer, Mr. Peter Simpson, Rugby. Honorary Secretary, Mr. C. Meiklejohn, Rugby. Committee: Messrs. C. Dakin (Cradley) and E. L. Adlington (Worcester) were elected in place of the retiring members. Auditors, Messrs. J. Brooks (Derby) and J. Young (Etruria). After luncheon the members were conveyed in carriages to the oil-gas works at Worcester Wharf, and the electric lighting plant at Lawley Street, which were kindly thrown open to their inspection by the Midland Railway Company. They were conducted over the former works by Mr. Brooks. The party afterwards drove to the Windsor Street Gas-Works of the Birmingham Corporation, where Mr. Charles Hunt kindly received them and conducted them round.

The Committee regret to report the loss of one member by death—Mr. J. Heydon, of Mansfield. One member has resigned, owing to removal from this district; and five new members have joined. The attendance at the meetings during the year has been very good; and the Committee desire again to solicit the active support of the members in the furtherance of the work of the Association.

On behalf of the Committee,
R. O. PATERSON, President.
C. MEIKLEJOHN, Hon. Secretary.

A resolution was subsequently passed directing that a copy of the combined reports of the District Associations for the past year should be sent free to each member of the Association, as in former years.

The PRESIDENT then delivered the following

INAUGURAL ADDRESS.

Gentlemen,—On taking the chair to-day, at your invitation, I feel that my first duty must be to express again my appreciation of the confidence you have placed in me in calling upon me—for a third time, after a lapse of twelve years—to fill the office of President of the Association. Under no circumstances can it ever be anything but pleasing to feel that one retains the good opinion of one's professional brethren, and that the growth of years does not dim our ancient friendship. The increasing responsibilities of life do not seem to dispose one to aspire to office, as in the days when the flush of young manhood is upon one, and the ambition to lead is a strongly moving impulse. Not that I count myself in the sere and yellow leaf yet, by any means; but I confess that, had I been left to the

freedom of my own choice, I would have preferred to remain in the freer atmosphere of unofficial membership. There is just the fear, too, that inasmuch as the position has not been coveted by me, I may not be able to throw myself into the work with that enthusiasm which is necessary to success, and so fulfil the flattering expectations you have so kindly formed regarding me. Relying upon the active support of each member, I trust we have entered upon a year of increased usefulness to the industry we represent, and of prosperity to our own particular Association.

After the troubles we have passed through in the Midlands and elsewhere, owing to the long continued and ruinous dispute in the coal trade, it seems impossible for us to meet without alluding to the subject. It will be long before we forget the closing months of 1893. And yet, what can be usefully said? We may live down the feeling of almost despair with which we viewed our steadily decreasing coal stocks, and the yet greater consternation with which we contemplated the tenders of the fortunate colliery owners who were in a position at the time to offer us supplies of a kind. But whether we can do anything to bring about that feeling of interdependence between capital and labour, the dislocation of which is literally tearing our national commercial prosperity to pieces, is not easily seen. Time, the great healer, may do much to restore confidence between employer and employed; but not yet. That another great struggle is imminent sooner or later is only too apparent. To attempt to override the laws of "supply and demand," by the figment of a "living wage," is simply to court dispute and disaster, and that of a national character. No one grudges the toiling miner a good wage, and there is no class of labour which deserves it more; but the fixing of a minimum wage is not a matter that can be left to the miner alone to settle. He will have to learn "to live and let live." To us, as gas manufacturers, the outlook is not reassuring. We can find no convenient substitute for coal; and if the cost is to be permanently raised, the price of gas must follow in the same direction. The iron manufacturer is in a different position. To him artificially dear coal—preventing him from competing in the open markets of the world—is absolute ruin; and it means the ultimate closing of his works, followed by all the consequences of bad trade, and a declining national revenue. Events clearly point to the necessity of all gas authorities being well furnished with reserve stocks, so as to be in a position to meet an emergency such as that which has troubled us in the past year. The holding of larger stocks of coal necessarily implies the locking up of money, and a consequent increase in the cost of manufacture; but such a consideration cannot weigh against the obligation to maintain a supply of gas under all conceivable circumstances.

These remarks naturally lead me to speak of the economical production of coal gas. It has often been a reflection on gas engineers that there have been no improvements in the apparatus and process of manufacture since the days of its discovery at the beginning of the century. True it is, we still have retorts, condensers, purifiers, and gasholders as of old; but the extraordinary advances which have been made in gasholder construction are alone sufficient to remove from us the stigma of stagnation which such a charge involves. But, besides this, can we not point to the remarkably low price charged for gas in many towns, as examples of decided advancement? Still we should not rest content with the achievements of the past, but aim at further improvements.

In the matter of retort-house practice, there is perhaps more ground for fixing a charge of fossilization than in any other department of a gas-works. It does not matter whether one visits a village gas-works or one in a great city, the gas-producing plant will be found much the same in both cases. A longer or shorter range of settings, with three, six, nine, or other number of 10 feet single or 20 feet through retorts, according to the magnitude of the works; nicely arranged rows of ascension-pipes; and on the top of the bench, the all-but-universal hydraulic main—these are the characteristics of them all. It is to be feared we have followed, to some extent, a rule-of-thumb in the length and size of our retorts, without considering the effect of either the one or the other upon the gas generated from the coal. In the early days of our industry, retorts 6 feet to 7 feet long were commonly used; but by degrees engineers, driven, probably in the first instance by the exigencies of floor-space and subsequently by a spirit of emulation and rivalry, to increase the productive power of the works, steadily increased the length of the retorts; and by a grand leap arrived at last at the "through" retort. No consideration of the effect on the gas from the longer contact with the red-hot surfaces of the retort is known to have guided these changes. The greatest production of gas upon a given area of retort-house floor appears all along to have been the main consideration, irrespective altogether of the effect upon the gas.

There can be no doubt, however, that very serious injury is done by this longer contact in the hot retorts. Comparative experiments on the carbonization of coal in short and long retorts show that there is a great loss of illuminating power and yield of gas by its partial decomposition in the latter. With the command we now have over the heats of our retorts by improved furnaces, there is no doubt that shorter retorts than are usual might be adopted without occupying more retort-house space; and the advantages in the greater yield and quality of the gas produced would more than counterbalance any extra cost that might be incurred in the provision of a greater number of retorts. In the case of retorts with a length of 9½ feet to the middle wall, there is not perhaps any very serious injury done to the gas produced from high-class coal, if it is drawn off as quickly as generated and not kept under pressure; but in the case of through retorts, for instance, when the gas sometimes (and it very often does, I am inclined to think from a recently investigated case) travels the whole length of a 20 feet retort, and is drawn off by one only of the two ascension-pipes, the depreciating effect upon the quantity and quality of the gas must be great.

There is another matter in this connection which the practical gas-maker has to bear in mind—namely, the formation of naphthalene. High heats are generally credited with the production of this troublesome compound; and, of course, it is true in a sense. But the long contact of the freshly generated gas with the sides and roof of the red-hot retort is the greatest source of evil. High heats, short retorts, and the quick withdrawal of the gas from the retorts, would do away largely with naphthalene, which, in its wrong place, is perhaps the most annoying thing that a gas manager has to cope with.

The effect of carbonizing coal in inclined retorts too, where the gas has to travel an unusually long distance over a highly heated surface against its natural course, is more easily imagined than stated. It is certainly significant that up to this time there has been no authoritative statement of the carbonizing results obtained from this system of retort-setting in this country, although it is in use in several large works. An immense amount of mechanical skill has been brought to bear upon the construction of retort-benches; but the effect upon the carbonization of coal is somehow never mentioned. To get coal into the upper end of the retort, and the coke out (when it will come) at the lower end as cheaply as possible, has, so far as I have ascertained, been the one and only consideration. In one large installation which I saw, the roofs of the retorts, into which I looked, were festooned with carbon from end to end; and you know where that carbon came from.

Of course, it is a truism to say that our one great aim is to get the largest quantity of gas, of the highest possible illuminating power, from the coal. It would be the ideal of carbonization to produce only gas and coke from coal, and perhaps a little ammoniacal liquor. Unfortunately, we have not yet found the way to carbonize coal without getting tar. If it could be done—and I believe it is possible to a large extent, by proper means—the gaseous product from a ton of coal would be considerably increased. With our ordinary plant, as it exists at the present time, we are never likely to reach such a desirable achievement.

A great element or factor in the economical production of gas is the removal of pressure from the interior of the retort. It was a fatal error which Grafton made when he introduced the exhauster and retained the hydraulic main. The marvel is that the error is perpetuated to this day. To me, after an experience of twenty-four years in a works making up to 2 million cubic feet of gas per day, in which the hydraulic main is conspicuous by its absence, it is simply astounding that it has continued to be in almost universal use. "Anti-dips," as all contrivances for the abolition of the seal of the hydraulic main have come to be called, are applicable to works of any magnitude; and their adoption in the future is likely to extend. More than one works in the Midlands have followed the Cheltenham plan in the last few years with beneficial results—one being the newly-constructed works in this town, of which Mr. North is Engineer. The absolute gain to be derived from the system, as compared with the hydraulic main, is somewhat difficult to estimate; but suppose it were put at 500 feet per ton, does it not open up the prospect of a saving sufficiently tempting to induce every gas-maker to adopt it? The increase in the quantity of gas is not the only gain to be derived from the system, because it can readily be understood that the quality of the gas must also be improved, not only from its rapid withdrawal from the influence of heat in the retort, but the deleterious effect of the gas having to force its way through a comparatively cool liquid in the hydraulic main, is removed. No one will question the rough-and-ready convenience of the hydraulic seal for shutting off a back-flow of gas when the retort is opened. But it is none the less a slovenly way of doing it; and, scientifically considered, it has not a single recommendation. Experience shows that its abolition with all its attendant gain is not impossible. It is objected that, with the anti-dip, there is more liability to accidents from explosion, back pressure, irregularity of exhaust, and the drawing in of furnace gases. I have not experienced these troubles. With a good exhauster, properly attended to, and a well-balanced regulator, there is no reason whatever why the system should not be adopted in every gas-works. In these days, especially, any means, by which economy of manufacture can be brought about, is worthy of attention; and the abolition of the hydraulic main is one means by which this may be accomplished. Just one word of caution! Do not attempt to work one section of retorts with a hydraulic main, and another section with "anti-dips" in the same house, except under special circumstances. And again, each setting of retorts should be capable of being entirely shut off when out of use.

The question, What is in a ton of coal? has often been

asked; but it has never been satisfactorily answered. It was Dr. Frankland, I believe, who stated to a Committee of the House of Commons that he found the yield of a ton of coal to be 15,000 cubic feet of gas. But there are coals *and* coals. The conditions of manufacture which may be the best for one kind of coal may not be the best for another kind; and the mixture of the two may again require different treatment. In my experimental work, I have at times obtained astonishing results from the carbonization of coal under apparently normal conditions; but they are always difficult to repeat. The disturbing element is not, I think, always to be sought for in the retort alone. The influence of condensation, both on the quantity and quality of the gas, has a most important bearing, especially on the illuminating power. Condensation begins at the mouthpiece; and, of necessity, the ascension-pipe plays a conspicuous part. The higher the heat of the retort, the more important becomes the question of condensation.

I cannot now enter into a discussion of these questions in detail; but I may observe that benzol, for instance, which is a product of high heats, is particularly liable to be absorbed by the heavier tarry vapours. Some years ago I conceived the idea that, by lengthening the ascension-pipe, it would be possible to condense a large portion of the tarry vapours in the upper part of the pipe, and get them to trickle down to the mouthpiece, and there be reconverted into gas. I began with only moderate lengths of pipes, fearing that there would be trouble from stoppages. Contrary to expectation, the higher the pipe was carried, the cleaner it became; and at last it was carried through the retort-house roof over 30 feet from the mouthpiece. The gas from this retort was taken away separately to the condensers; and the liquid products were collected and measured. The tar was found to be in excess of the normal quantity, and unexpectedly thin. The experiments were repeated in the laboratory, when it was again found that the production of tar was greater in volume, and more fluid, than ordinarily with each increase in height of ascension-pipe; while at the same time the illuminating value of the gas became lower and lower. The shortest pipe was the best for the gas; and, conversely, the longest the most injurious. These results were a revelation to me; and it was difficult to grasp the facts all at once. It was but a step to reverse the order of things, and turn the pipe downward close to the mouthpiece. This form of pipe yielded surprisingly good results in some instances; and if it were capable of being applied in practice, it might be adopted with advantage. I believe the idea was tried somewhere in this country some years ago, and abandoned; but I have not been able to trace a reference to it.

Unfortunately, our retort-houses do not readily lend themselves to modifications of the ascension-pipes; and, by force of circumstances, they must be comparatively long. Some years ago I had been led to increase the height of the top and middle rows of ascension-pipes in settings of eight retorts, heated by regenerative furnaces, as a remedy for stoppages; and I succeeded in accomplishing my object. But there is evidently a limit of economy in this respect.

The treatment of the gas from the ascension-pipe to the condenser, when it may be said to be in a critical condition, is a matter of far greater importance than is generally understood. Mr. Humphrys, of Salisbury, read a paper bearing on this matter before the South-West Association a few years since. The illustrations he gave of the advantage of large mains in the retort-house are of considerable value. It is not possible perhaps to lay down a law to determine the exact size; but that there is an intimate relation between the capacity of the main and the volume of gas, there can be no doubt. Actual experience will probably furnish the best coefficient. A case has been under my notice in which there is unmistakeable evidence that an 18-inch foul main along the inside wall of the retort-house has, over and over again, utterly broken down in efficiency on charging 9 per cent. more retorts. It will not be understood that the 18-inch main was too small to convey the gas. What is meant is that, chemico-physically considered, it ceased to be efficient. How the molecules of the hydrocarbons in coal gas arrange and rearrange themselves in the hot condensing main may never be discovered. If, however, we could obtain a clearer insight into the changes involved in the carbonization of coal, and the condensation of the resulting gas, it might be possible to effect improvements undreamt of now. I may be accused of uttering Utopian ideas; but if I succeed in inducing any of our young members to devote themselves to the study of these important matters, my object will be attained, and good results may follow.

In large works it is sometimes difficult to experiment; but if someone in charge of a small works, with single retorts, could manage to make the experiment of drawing off the gas in a horizontal condensing pipe under cover, on a level with the mouthpieces, until the temperature of the gas has been reduced to that of the atmosphere, it would be interesting to know the results, for I am convinced that all forms of vertical condensers, in which the gas ascends, are a mistake if there are any tarry vapours left in the gas. Such an experiment, to be successful, would have to be made with high heats, a series of retorts charged at intervals, and no hydraulic main.

As gas manufacturers, our chief object is (or should be) to make gas and not tar. At the best we must look upon the quantity of tar made per ton of coal as a measure of the perfection or otherwise of our manufacturing plant. After tar has once been formed, it is exceedingly difficult to convert it into permanent gas. The heat required is so high that decomposition takes place from contact with the red-hot surface of the retort, depositing carbon; while, on the other hand, if the heat is not high enough, the vapours are condensed and return to the tar-well. Notwithstanding these difficulties, however, our greatest hope of getting an increased yield of gas from coal lies in this direction. The Dinsmore process seemed to offer a solution of the matter; but the results so far obtained at the works where it has been tried have not been of such a character as to encourage others to take it up. The failure as well as the success of the Dinsmore process, I am inclined to think, rests with the class of coal used more than anything else, although the probable injurious effect of the heated duct must not be overlooked. It is possible with some of the Wigan coals to get gas of a high candle power in ordinary work in the laboratory; and the tar is of such a nature that it is readily gasified or vaporized, rendering these coals peculiar in this respect. Treating such coals by the Dinsmore process, one would expect, and I should think would probably get, gas of 20-candle power. But if, for instance, Durham coal were tried in the same apparatus, the result would be disappointing. The coal is not so good to begin with, and the tar from these coals contains less of those light hydrocarbons upon which the success of the Dinsmore process depends. Knowing these facts, one is not surprised to find that failure has often resulted.

When tar is gasified in red-hot vessels, it will not generally be found to yield sufficient light-giving hydrocarbons to raise the illuminating power of coal and tar gas together to a higher standard than that ordinarily obtained from coal alone. The fact is tar has enough to do to look after itself. One cannot help sympathizing with those who attempt to solve this problem —the *bête noire* of the gas-maker. Gasification of tar has been the dream and aim of gas managers from very early days; and it is no discredit to have tried and failed.

The process of Mr. Young, of Peebles, presents a new solution which seems to have in it the elements of success; and we hopefully wait the issue of experiments upon English tar. My own efforts in this direction have been on different lines. By dealing with the coal and tar in the same retort, in an experimental apparatus, a production of 13,000 to 15,000 cubic feet of gas per ton of coal has been obtained, with the utmost regularity. It is too early yet to say what the results may be on a practical working scale; but if by using only a portion of the tar an increased yield of gas of (say) 10 per cent. over the ordinary production can be obtained, it is worth aiming at.

This matter *must* press itself to the front sooner or later. A valuable hydrocarbon like coal tar should never be allowed to leave our works as such. I believe if the right means are adopted, it might all be converted into gas; and it is not necessary to point out to you what an important bearing such a consummation would have upon the vexed coal question, to say nothing of the economic aspect of the case.

Oil gas as a substitute for cannel for enriching ordinary coal gas, has been occupying a good deal of attention lately—indeed, a perusal of the proceedings of some of our Association meetings might almost lead one to think that the coal gas industry has ceased to exist. As a means to an end, oil gas may make a place for itself in the economy of gas-works; but whether it will ever play the important part which some are inclined to assign to it, time alone will show. In one respect the oil craze, as represented by the carburetting process, I consider has been an unmitigated evil, inasmuch as it is responsible for breaking in upon the time-honoured custom of calculating the cost of making gas at a price per 1000 cubic feet into the gas-holders.

The distillation of heavy oils for the production of high lighting power gas is an attractive study, and I had intended to make some remarks upon the subject; but my time is up. It may not be out of place, however, to give expression to an opinion that care should be exercised in deciding whether cannel coal or oil shall be used as an enricher; for there appears to be reason for believing that in some cases ordinary coal gas cannot be so cheaply enriched with oil gas as with cannel. Experimentally, this has been found to be the case—with some Durham coals, for instance, as well as other kinds.

On the motion of Mr. Henry Hack (Saltley), a hearty vote of thanks was accorded to Mr. Paterson for his interesting and instructive address. Subsequently the courtesy of the Commissioners in offering the facilities they had for the holding of the meeting was duly acknowledged, and replied to by Mr. H. Collis, the Chairman of the Commissioners.

This concluded the formal business of the meeting; and the members then inspected the Stourbridge Gas-Works, which within recent years have been entirely rearranged and rebuilt on modern lines; and admiration was expressed, on all hands, at the excellent means afforded by the plant at Mr. North's disposal for the economical manufacture and distribution of gas throughout the town. The main object of the visit, however, was to inaugurate the new two-lift gasholder on the Gadd and Mason principle, which has recently been completed by Messrs. R. and J. Dempster, of Manchester. The spiral rails for guiding the holder in its ascent and descent are in this instance fixed outside the shell of each lift; and the rails work between rollers

attached to carriages fixed upon the dip of the outer lift and at the side of the tank, for the purpose of guiding the upper and lower lifts respectively. The outer lift is 100 feet diameter by 30 feet deep; and the inner lift, 97 ft. 6 in. in diameter by 30 feet deep. The crown of the holder is trussed in the usual manner. The upper lift is guided by means of twelve spiral rails, and the lower one by fifteen. The holder, at the time of inspection by the members, was filled to the extent of about two sheets of the lower lift; and Mr. North had arranged to empty the gas rapidly into another holder, so that his visitors could see the new holder uncupping. There was not the least hitch in the whole proceedings; and the satisfactory way in which the holder worked throughout was most favourably commented upon by all present.

A hurried visit of inspection was next made to the works of Messrs. Jones and Attwood; and then the members proceeded to the Talbot Hotel, where they had been invited to dine by the Chairman of the Gas Committee and Mr. North. After dinner a short toast list was gone through; and the majority of the members then left for Birmingham by the 5.30 train. Much satisfaction was expressed at the excellent arrangements made for the comfort and convenience of the party.

THE CHEMICAL TECHNOLOGY OF COAL GAS.

By Professor VIVIAN B. LEWES, F.I.C., F.C.S.

[A Course of Lectures delivered at the Stratford Town Hall.]

IV.—*The Purification of Coal Gas.*

As the mixture of gases and vapours leaves the retort, purification may be said to commence with the condensation of tar and ammoniacal liquor in the hydraulic main; these residuals being finally entirely extracted by the action of the condenser, washer, and scrubber. The true impurities, however, consist of certain gases and vapours which the manufacturer desires to remove from the gas, either because they interfere with its illuminating value, or because he is compelled to do so by the Acts under which he works. These impurities are carbon dioxide, sulphuretted hydrogen, and bisulphide of carbon, together with minute quantities of the vapour of other organic sulphur compounds which have never been properly identified, and of which we know practically nothing.

Before discussing the methods by which these impurities are removed from the crude gas, it will be well to gain an insight into their characteristics, and the methods by which they can be detected.

Carbon dioxide (CO_2) is found in Nature free in the air to the extent of at least 4 parts in 10,000; and also in many mineral waters. In the combined state, it unites with various bases as carbonates, which are very plentiful—whole chains of hills being formed of calcic carbonate, or chalk. Carbon dioxide is formed whenever any substance containing carbon is burnt in air or oxygen; but when wanted in the pure state, the most convenient way of preparing it is by acting on calcic carbonate with a strong acid, which expels the carbon dioxide, and unites with the calcium—at the same time forming water.

Calcic Carbonate. Hydrochloric Acid. Calcic Chloride. Water. Carbon Dioxide.

$$CaCO_3 + 2(HCl) = CaCl_2 + H_2O + CO_2$$

In practice, marble is broken up into small pieces and placed in a two-necked bottle, fitted with a thistle funnel and a leading-tube; water is poured over the marble, and hydrochloric acid is added down the thistle funnel. There ensues immediately a brisk evolution of gas, which may be collected over water in the pneumatic trough.

Carbon dioxide is a colourless, odourless gas, which will not burn or support ordinary combustion. It has a slight acid taste and reaction. Nearly all spring waters contain it dissolved in greater or less quantity; and it is this gas which gives the property of temporary hardness to such waters, owing to the formation of an unstable acid called carbonic acid, which is able to dissolve many substances—such as calcic carbonate, magnesic carbonate, &c.—which are not dissolved by the action of the water alone. Under ordinary conditions of temperature and pressure, water will dissolve its own volume of the gas—*i.e.*, at 15° C. and 760 mm. a pint of water will dissolve a pint of the gas. But a change in temperature or pressure will be accompanied by a change in the quantity of gas dissolved; so that if the water were cooled down to 0° C., the pint of liquid would dissolve nearly 1¾ pints of the gas. When, however, the additional pressure is removed, or the temperature is raised, the excess of carbon dioxide escapes, and causes the water to effervesce. Carbon dioxide can be condensed to a liquid by cold, or by a pressure of 36 atmospheres; and if the liquid is allowed to assume the gaseous state, the cold produced by the sudden transition from the liquid to the gas is so great that some of the liquid is frozen into a solid mass in the form of snow, which has a temperature below −78° C. Carbon dioxide has a specific gravity of 1·520, and may be poured from one vessel to another like water. Potassium will burn in an atmosphere of the gas, when heated, decomposing it; forming potassic oxide, and at the same time depositing carbon. Carbon dioxide dissolved in water forms a solution having faintly acid properties. This solution is supposed to contain the hydrogen salt H_2CO_3—carbonic acid—which has never been isolated. Carbonic acid forms two classes of salts—carbonates and bicarbonates. In the carbonate, the hydrogen of the carbonic acid is completely replaced by the base; in the bicarbonate, only one atom of the hydrogen is so replaced. Carbon dioxide may be detected by its forming a white precipitate when allowed to come in contact with lime water; this being due to the formation of chalk or calcic carbonate, which is insoluble in water. It is also characterized by its inability to support combustion, and by its ready solubility in solutions of sodic and potassic hydrate.

The carbon dioxide present in coal gas is formed partly from the oxygen in combination in the coal, and partly from traces of air leaking into the retort (the oxygen of the air, by burning some of the carbon, yielding carbon dioxide); while a small proportion may find its way through the pores of the retort from the furnace gases. It is essential that the carbon dioxide should be removed from the gas as completely as possible, as even a trace of it diminishes the illuminating value to a greater extent than is the case when accidental admixture takes place with any other inert gas, or even with oxygen.

The influence of incombustible diluents on the illuminating power of ethylene has been determined by Dr. Percy Frankland, with the following results:—

Diluent.	Percentage of Ethylene.	Percentage of Diluent.	Candle Power per 5 Cub. Ft. of Gas.
Carbon dioxide	93·68	6·32	55·52
	90·59	9·41	51·81
	89·03	10·97	49·98
	81·73	18·27	42·81
	70·75	29·25	33·23
	64·14	35·85	26·52
	52·94	47·06	14·72
	45·61	54·39	7·49
	40·00	60·00	0·00
Nitrogen	84·69	15·31	51·96
	71·12	28·88	39·58
	59·93	40·07	29·64
	47·08	59·92	20·81
	36·24	63·76	11·82
	48·81	71·19	7·20
Oxygen	82·57	17·43	70·93
	80·67	19·33	72·53
	75·51	24·49	74·19
	68·50	31·50	71·17
	60·69	39·31	Explosion.
Air	79·68	20·32	54·45
	67·15	32·85	45·84
	55·92	44·08	37·16
	42·69	57·31	26·78
	33·91	66·09	16·22
	22·31	77·69	0·61
	13·31	86·69	Explosion.

While moisture, when present to the extent of 2 per cent. (the proportion present in coal gas saturated at 20° C. and 760 mm.) in ethylene, reduces the illuminating power 3·6 per cent., or in coal gas 3·3 per cent.

Of the inert or non-combustible diluents, therefore, carbon dioxide is the most injurious, and atmospheric air is the least harmful. Wurtz has determined the loss of light incidental to the addition of air to coal gas; and he gives the following results:—

Added Air.	Percentage Loss of Light.
3·00	15·69
4·96	23·83
11·71	41·46
16·18	57·53
25·00	84·00

The addition of oxygen to gases rich in hydrocarbons causes an increase in the illuminating power up to a certain point. The temperature of the flame is increased by burning up the hydrogen of the hydrocarbons, and rendering the carbon incandescent without diluting the flame with nitrogen to the extent which would have been necessary had air been used for the purpose. This effect is very noticeable in rich hydrocarbon gases of more than 50-candle power; but in a poor coal gas of (say) 16 candles, it is very difficult to get any increase in illuminating power—even a small percentage of oxygen overdoing the combustion.

The effect of such gases as hydrogen and carbon monoxide is simply to dilute the flame, and, by separating the molecules of the hydrocarbons, to make them more difficult to decompose; while such bodies as the carbon dioxide, nitrogen, air, and water vapour, not only dilute but also cool the flame, as they do not add to the heat by any action of their own, and have to be heated up to the same temperature as the flame itself.

Sulphuretted hydrogen (H_2S) was discovered by Scheele in 1777. It exists in a free state in volcanic emanations, and in certain mineral waters (such as those of Harrogate); and it is formed when organic substances containing sulphur undergo decay. Sulphuretted hydrogen can be made by the direct combination of its constituents, as when hydrogen is passed through or over boiling sulphur; and in the manufacture of coal gas small quantities are formed by the sulphur vapour distilling out from the disulphide of iron (pyrites or coal "brasses") combining with the hydrogen of the gas. The general method of preparing it, however, consists in decomposing a metallic sulphide with an acid. Ferrous sulphide is the substance most commonly used; and it is decomposed by dilute hydrochloric or sulphuric acid, when sulphuretted hydrogen is set free in abundance, and at the same time ferrous chloride or sulphate is formed—

Ferrous Sulphide. Sulphuric Acid. Ferrous Sulphate. Sulph. Hydrogen.

$$FeS + H_2SO_4 = FeSO_4 + H_2S$$

Sulphuretted hydrogen is a colourless gas, having a sweet taste and the odour of rotten eggs; and when present in air in large quantity, it is poisonous. Under a pressure of 17 atmospheres, or at −74° C., it may be condensed to a colourless liquid, which freezes at 86° C. The gas can be decomposed by heat, and is freely soluble in water, which dissolves 4·37 times its bulk of the gas at 0° C. It has a feeble acid reaction, and burns in oxygen or air. If the supply of air is abundant, the gas burns to water and sulphur dioxide—

Sulph. Hydrogen. Air. Water. Sulphur Dioxide. Nitrogen.

$$H_2S + 3(N_4+O) = H_2O + SO_2 + 6N_2$$

If, however, the supply of air is small, and therefore the quantity of oxygen limited, the hydrogen burns, forming water, and sulphur is deposited.

Hydric sulphide may be detected by its smell, and by its action on lead paper (strips of bibulous paper which have been dipped in a solution of lead acetate). On exposing a strip of this paper to the action of sulphuretted hydrogen, an immediate blackening takes place, due to the formation of lead sulphide. The affinity which sulphuretted hydrogen has for metals is the cause of the rapid tarnishing of silver and electro-plated goods in town air—an action which is not noticed to nearly the same extent in the country. In the neighbourhood of gas-works, the tarnishing and darkening of lead paint and metal goods is, as a rule, ascribed to traces of this gas escaping from the purifiers; but the fact is always overlooked that such blackening and tarnishing are always produced by the air of a large city, especially during periods of fog. The formation of fog in air tends to keep down all the products of combustion generated by the consumption of enormous quantities of soft coal which takes place in a big town, with the result that during foggy weather the impurities rise to a very high percentage; and as one of these substances is sulphuretted hydrogen, it will often be noticed that silver will become badly tarnished by exposure for an hour to a yellow London fog.

Carbon disulphide (CS_2) is prepared by passing the vapour of sulphur over charcoal heated to redness. On making the resulting product flow through a condensing-tube, an impure form of carbon disulphide is obtained, which has to be purified. Carbon disulphide is a colourless, heavy, and extremely volatile liquid. The commercial product has a very fœtid and repugnant smell; but when pure it has a sweetish, ethereal odour, and an acrid, pungent taste. It is a highly refractive, and has a specific gravity of 1·29. Water dissolves about 1-1000th of its volume of the bisulphide, and yields it up again on distilling; the solution possessing a burning taste, with the odour of the bisulphide. Many substances insoluble in water are soluble in this liquid—such as sulphur, phosphorus, iodine, caoutchouc, fats, and oils. Carbon disulphide boils at 46° C. Its vapour, when mixed with three times its volume of oxygen, ignites with explosion; forming sulphurous and carbonic acid gases, thus:—

$$CS_2 + 3O_2 = CO_2 + 2SO_2$$

The vapour of carbon disulphide, when mixed with nitric oxide, burns with a blue flame, which is very rich in rays of high refrangibility, and has, on this account, been used in photography. On passing the vapour through a tube heated to bright redness, it is partly resolved into its elements; carbon depositing, and sulphur passing off with the undecomposed portions. The vapour of bisulphide of carbon has an excessively low igniting-point, and will take fire at a temperature of 300° Fahr. (149° C.). But the trace present in coal gas is so minute that it could not affect its point of ignition; besides which Dr. Frankland has shown that even the smallest trace of ethylene in a gaseous mixture which contains the vapour of bisulphide of carbon destroys this great inflammability.

The formation of the bisulphide of carbon vapour found in coal gas is due to the direct action of sulphur vapour upon the red-hot carbon. If powdered charcoal or coke be mixed with powdered sulphur, and the mass heated, sulphur vapour distils off, and no bisulphide of carbon is produced, because the sulphur has all volatilized before the carbon is in a sufficiently heated condition to bring about combination; and if the sulphur in the coal were in the free state, the same thing would happen. When coal is put into the hot retort, the portions in contact with the sides are rapidly raised in temperature, and the sulphur is liberated by the breaking up of the disulphide of iron, pyrites or "brasses," vaporizes, and combines with free hydrogen to form sulphuretted hydrogen. But by the time the pyrites in the centre of the mass of coal are sufficiently heated to yield sulphur vapour, the outer surface of the partly coked mass is at a temperature high enough to form with it small traces of bisulphide of carbon; and the higher the temperature used, the more of the "sulphur compounds other than sulphuretted hydrogen" are produced.

In the following table, obtained from experiments made by Mr. Lewis T. Wright, this is shown very clearly; the yield of gas per ton of coal being taken to give an idea of the temperature, while the grains per 100 cubic feet of sulphur compounds in the gas are after purification from sulphuretted hydrogen—the same coal being used in each case:—

Yield of Gas per Ton.	Sulphur per 100 Cubic Feet. Grains.
6,893	13·9
8,370	19·1
9,431	26·7
10,772	36·9
11,620	44·1

It will be found that, in the crude gas made by the Metropolitan Gas Companies, the sulphur compounds other than sulphuretted hydrogen will average from 30 to 40 grains of sulphur per 100 cubic feet of gas.

In January, 1854, the late Dr. Letheby, who was then the Superintending Gas Examiner to the Corporation of the City of London, made some very highly-coloured statements in reference to some conclusions at which he had arrived with regard to certain impurities in London coal gas. Up to that time it had been the practice of the Companies to remove sulphuretted hydrogen from the gas before it was sent out to the consumer; and Dr. Letheby conclusively showed that, besides this impurity, the coal gas contained other sulphur compounds from which it could not be freed by the purification that served to get rid of the more obnoxious sulphuretted hydrogen. Having found out that these sulphur compounds did exist in the coal gas, he fell into the not unnatural error of over-estimating the importance of his discovery; and the extravagant view he took of the subject is at once manifest from some of his utterances at that time. He said: "I have found that some of the Companies are supplying to the Metropolis gas which, in the course of a few years, must do very great damage to property, and deteriorate the atmosphere, for it is so highly charged with carbon disulphide that I have been able to obtain as much as 21 grains of oil of vitriol from 100 cubic feet of the gas; and this deleterious gas is getting into the atmosphere." Again: "There is no library in the Metropolis, in the upper shelves of which the books are not tumbling to pieces from this gas; and I have no hesitation in saying that whatever is injurious to inert matter is far more likely to be destructive to living beings." He added that he had examined the snow which had then been recently falling round London, and found that it was highly charged with sulphuric acid, and that the leaves of trees were in the same condition. These utterances, coming as they did from a man who held an important position in the gas world, were taken up by the daily Press; and a popular outcry was started against allowing the presence of such substances as carbon disulphide in the gas. So great was the effect upon the public mind, that the limit of sulphur compounds permitted in coal gas was cut down to the smallest quantity which practice has shown can be maintained in the gas.

In considering the effect of these sulphur compounds in the products of combustion, it must be borne in mind that, when coal gas is burnt the sulphur is liberated in the form of sulphur dioxide; and many most misleading statements and ideas have gained ground as to the quantity of this which becomes converted into sulphuric acid in the atmosphere. My own experiments, as well as those of Mr. Harold B. Dixon, all prove that, when traces of sulphur dioxide, as minute in quantity as those which are given off in the combustion of gas, are present in the air, they show no tendency to oxidize to sulphuric acid, even though the air is highly charged with moisture, unless the temperature falls to such a point that water is deposited from it. This water then takes up the sulphur dioxide, which slowly becomes oxidized to sulphuric acid. For this reason it is perfectly possible to find traces of sulphuric acid and sulphates upon window-panes where the cold air outside has caused moisture to condense on the windows; and the same action will take place where you have ammonia or other alkaline substances present in the air or dust fixing the sulphurous acid. But it is manifestly incorrect to suppose that this action goes on unless the temperature of the room has fallen to the condensing-point of the water vapour; for, if this did take place, even with the highly-purified London gas, there is not a sitting-room in London in which the draperies would not become rotted in a very short space of time, as the smallest deposit of sulphuric acid, no matter how dilute, would, by slow and cumulative action, become sufficiently strong to burn away the fabric. The test of time has shown the fallacy of any such injurious action.

In order to prove the deleterious effects of this hypothetical formation of sulphuric acid, certain observers have brought forward many experiments to show that, in passing the air through absorbing solutions, sulphates could be detected in them in small and varying quantities. This, however, certainly does not prove that sulphates were present in the air, as, directly the sulphur dioxide is absorbed by the liquid, the oxidation to sulphuric acid takes place with considerable rapidity. It is this that has given rise to wrong deductions from the observed facts of sulphuric acid, either free or in combination, being found in wetted fabrics, or on moistened plates or liquid absorbents exposed to the air of rooms in which gas has been burnt, also on lamp-glasses and in ventilating-tubes, especially in towns where no limit is placed on the amount of sulphur present in the gas.

It has also been considered a proof of the formation of sulphuric acid from the products of combustion of gas containing sulphur compounds, that dust collected in a room in which such gas is being burnt contains small quantities of sulphates. But here again several important factors of error have been overlooked. The dust which is found in a room has not been formed in that room, but has filtered in from the outside air, under the sashes and other openings; and it must, of necessity, contain sulphur compounds, which have been produced by the fixation of the sulphur produced by the burning of coal and coke, by the ammonia and other alkaline bases present in the air. An analysis of dust from rooms in which no gas has been burnt will also show the presence of these bodies in as large quantities

as from the rooms in which gas has been consumed in very considerable volume. Dust collected in my study at Greenwich, in which gas is very freely burnt, gave 3·05 per cent. of sulphur as sulphates; while dust collected in an attic in a disused portion of the same building, in which there has never been a gas-fitting, gave 4·4 per cent. This mistake has been caused by the fact that rain-washed dust collected on exposed outside sills often contains only a small percentage of sulphur. The closeness and oppressive feeling which can be distinguished in a room that is not properly ventilated, when gas is being burnt, is not due to the presence of sulphur compounds, but to carbon dioxide, and to the traces of the products of incomplete combustion. It is also partly owing to the organic emanations from the bodies and lungs of the occupants of such a room being unable to rise into the zone of highly-heated air which exists above the gas-burners in the room, and so being kept down to the level from which the air for respiration is being drawn.

To remove the various impurities, the crude gas, as it leaves the retort-houses, is first made to pass through condensers and washers, in which the gas deposits its least volatile constituents, such as tarry vapours and water highly charged with ammonia compounds, and is then led through the scrubbers, which are circular towers, generally from 36 to 48 feet in height, and filled with boards on edge and brushwood, up through which the gas passes and is met by water, which trickles down over the large exposed surfaces, and washes the gas free from ammonia—at the same time removing small quantities of the other impurities. The approximate composition of the gas after its passage through the scrubbers is as follows:—

	Per Cent.
Hydrogen	48·55
Methane	39·70
Illuminants	3·30
Carbon dioxide	2·50
Carbon monoxide	2·00
Oxygen	0·45
Nitrogen	3·50
	100·00

With Durham coal, such as that used at most of the London works, there would also be present in each 100 cubic feet of gas about 400 grains of sulphuretted hydrogen, and from 35 to 40 grains of sulphur as sulphur compounds other than sulphuretted hydrogen.

In order to free the gas from sulphuretted hydrogen and carbon dioxide, and to reduce the other sulphur compounds below the statutory limits, the gas is next made to flow through the purifiers. In most of the London works, lime is the chief material employed for purification; and the gas is caused to pass through several purifying-boxes, and finally through oxide of iron. The most generally accepted theory as to the chemical action which leads to the purification of the gas in this part of the process is that, as the gases pass through the lime, the latter first takes up carbon dioxide, becoming carbonate of lime. Until nearly the whole of the carbon dioxide is removed from the gas, the sulphuretted hydrogen is but little acted upon, as the carbon dioxide has, under these conditions, a greater affinity for lime than the sulphuretted hydrogen; and if sulphide of lime were formed, carbon dioxide and moisture would again decompose it. As soon as the carbon dioxide is all taken up, the lime begins to act upon the sulphuretted hydrogen, and absorbs it—forming sulphide of calcium and other more complex bodies, and liberating moisture; and the sulphides so produced have the power of taking up the sulphur compounds other than sulphuretted hydrogen. In this way they are reduced in quantity, and the sulphuretted hydrogen is almost entirely eliminated; and to get rid of the last trace of the latter, the gas is generally passed through hydrated oxide of iron.

The compounds which sulphur forms with lime, and which act in absorbing carbon disulphide, are not thoroughly understood. The most recent work on the combination of sulphuretted hydrogen with alkalies, by Mr. W. P. Bloxam, points to a complexity of composition which had not before been suspected; and there is no doubt that there are many factors in purification which are at present outside our knowledge—one of the most important of these being the effect of change of temperature and moisture on compounds formed by lime, sulphuretted hydrogen, and carbon disulphide.

In lime purification of the above character, there is very little difficulty in keeping the sulphur down to the prescribed limits under normal conditions, especially in the summer, when reduced output allows of a slower flow of the gas through the purifying material; but in the winter, the sulphur compounds are liable to sudden rise in quantity, due to causes which, being at present but little understood, are practically beyond the gas manager's control. These sudden rises are more frequent when the limit aimed at is (say) 17, than when it is 25 grains.

The work of Veley and others upon this subject point to the reactions probably being as follows: When pure dry hydrogen, saturated with the vapour of carbon disulphide, is passed over anhydrous calcic sulphide, no alteration in weight takes place; so that dry calcic sulphide is manifestly not the absorbent which acts in the lime purifiers. When, however, water is added to the calcic sulphide, it is converted into calcium hydroxy-hydrosulphide, thus:—

Calcic Sulphide. + Water. = Calcic Hydroxy-hydrosulphide.

$$CaS + H_2O = Ca(HO)(HS)$$

When hydrogen saturated with bisulphide of carbon vapour is passed into this, it first turns pale yellow, and a yellowish-red compound—basic calcic thiocarbonate—is formed; sulphuretted hydrogen being at the same time evolved.

Calcic Hydroxy-hydrosulphide. + Basic Calcic Thiocarbonate. + Sulphuretted Hydrogen.

$$2Ca(HO)(HS) + CS_2 = Ca(HO)_2\,CaCS_3 + H_2S$$

The thiocarbonate can be again partly decomposed, with evolution of bisulphide of carbon, when sulphuretted hydrogen is passed over it—an action which often takes place when crude gas containing much sulphuretted hydrogen is passing through the purifiers, in which case the sulphur compounds other than sulphuretted hydrogen are nearly always higher after passing the first purifiers than they are in the crude gas, as shown by the following experimental figures:—

	Carbon Disulphide in Grains of Sulphur per 100 Cubic Feet.				
Crude gas	15	..	22	..	33
Outlet of first purifier	46	..	58	..	62
Outlet of second purifier	28	..	37	..	36
Outlet of third purifier	11	..	15	..	17

And inasmuch as the absorption of the bisulphide is always accompanied by evolution of sulphuretted hydrogen, which goes forward with the gas, it seems to me that, when the lime is in the right condition for absorbing the bisulphide, the lime purifiers should be alternated with oxide boxes to prevent this action taking place.

During the purification of gas by lime, it has been found that if some air be admitted to the purifiers together with the crude gas, the oxygen of the air causes decomposition of some of the compounds of lime and sulphur, with deposition of sulphur (which can afterwards be recovered), and at the same time revives the power of the compounds present in the purifiers to absorb the bisulphide of carbon. The quantity of air so added must, however, of necessity be small, as the residual nitrogen, by diluting the gas, reduces its illuminating power.

These facts naturally suggested the idea of adding pure oxygen to the crude gas in such quantity as would complete the purification without leaving any residual gas to interfere with the illuminating power; and this process was introduced, and has been successfully worked out by, Mr. Valon. The commercial success of the oxygen process of purification is, of course, dependent upon the cheap production of oxygen; and at the present time two methods for doing this are in actual use in gas-works. When baric oxide is heated in a current of air, it takes up another atom of oxygen—becoming baric dioxide; and this, if heated to a higher temperature than that at which it was formed, gives off its acquired oxygen, and becomes once more baric oxide—

Baric Peroxide. = Baric Oxide. + Oxygen.

$$2(BaO_2) = 2(BaO) + O_2$$

It is upon this reaction that the process of Brin Frères for the production of oxygen on a large scale is based. Anhydrous barium oxide is placed in a series of retorts and heated; while air, carefully freed from carbon dioxide, is passed through them under pressure. The oxygen, being absorbed by the baric oxide, produces baric peroxide. The flow of air is then stopped, and the pressure reduced below that of the atmosphere, when decomposition takes place—pure oxygen being evolved. MM. Brin calculate that 1 kilo of their baric oxide will produce nearly 50 litres of oxygen at each operation.

Another process for obtaining oxygen from air depends upon the fact that the oxides of manganese, when heated in contact with alkalies and air, are able to absorb oxygen from the air, and will give it off again when heated in a current of steam. This was first introduced for practical working by Tessié de Motay many years ago; but it failed in practice, owing to defective mechanical arrangements, and to the fact that the materials, in the proportions in which they were then used, fused and choked the apparatus. But by very beautiful mechanical devices, and by improvements in the manganate mixture, Mr. Fanta has overcome these troubles; and his form of apparatus is yielding very good results, and promises to considerably cheapen the production of oxygen on a commercial scale.

The lime used for purification is prepared in large quantities by burning chalk or limestone—both of them impure forms of calcic carbonate—in egg-shaped kilns. The limestone is brought to the mouth of the kiln in waggons in fair-sized lumps. In the older kilns, large pieces were used to form an arch over the fire-grate at the bottom; the rest of the kiln being filled up with the smaller pieces mixed with coal or some other combustible material. The fire is then started, and kept going for about two days, after which time the lime is allowed to cool, and is then removed. In the modern continuous process, however, the limestone is renewed at the top, while the burnt lime is drawn from the bottom; lime and coal, in alternate waggon-loads, being supplied at the top as fast as the burnt lime is removed at the base. By this method of working, fuel is economized; and the smoke, so offensive in the old forms of kiln, is greatly reduced. About one bushel of coal is required for the manufacture of six bushels of lime, although some limestones require less. If a large amount of clay is present, the lime fuses very readily; and great care must be exercised in order to keep the temperature below the melting-point, otherwise a slag is formed.

When lime is brought in contact with water, great heat is evolved; and some of the water enters into combination with the lime to form calcic hydrate, or slaked lime. This calcic hydrate

is a white amorphous powder, sparingly soluble in water; the solution being known as lime water. This has an alkaline reaction, and absorbs carbon dioxide from the air, in like manner to caustic soda. Calcic hydrate is decomposed at a red heat into water and calcic oxide.

In oxide purification, Irish bog ore is generally employed, which contains, as a rule, about 32 per cent. of hydrated oxide of iron; but of this only about two-thirds is in a condition in which it can actively absorb sulphuretted hydrogen. The bog ore also contains a large percentage of moisture, sometimes amounting to nearly half its weight; but, for successful purification, it should not contain more than about 25 per cent. of moisture, as, when the quantity rises much above this, it becomes less sensitive, while if too dry it gets dusty, and works through the grids on which it is placed in the purifiers, and increases the resistance to the passage of the gas. When it is just damp enough not to pass through the grids, it is in the best condition for working.

As the crude coal gas passes through the hydrated oxide, sulphuretted hydrogen is arrested, and forms with the iron two sulphides—ferrous and ferric sulphide—at the same time liberating water. When the material ceases to absorb sulphuretted hydrogen, its original power can be restored by exposing it freely to the action of the air, when the sulphides deposit all their sulphur in the free state, and the iron, taking oxygen from the atmosphere, is rapidly converted once more into oxide of iron. This process of oxidation is called "revivification;" and it is effected by simply spreading the foul oxide on the floor, when it becomes warm, and gradually changes from black to its original reddish-brown colour. The material can in this way be revivified about sixteen times, after which the accumulation of free sulphur interferes with the action; and the mixture of oxide, with about 55 per cent. of free sulphur, is then sold to the sulphuric acid manufacturers.

If traces of ammonia and cyanogen find their way into the purifiers, ferrocyanide of iron is formed, which greatly interferes with its effect, and prevents its subsequent revivification; but this trouble rarely arises when lime purifiers are used before the oxide boxes.

The Directorate of the Faversham Water Company.—Mr. C. Holmes has been elected on the Board of the Faversham Water Company, in place of Mr. E. Bryant, who has resigned his directorship on leaving the neighbourhood.

The St. Pancras Electric Lighting Station.—At the meeting of the Society of Arts last Wednesday, Professor Henry Robinson read a paper on the above subject, some extracts from which we hope to give in an early issue. It led to a discussion, in which the Chairman (Mr. W. H. Preece, C.B., F.R.S.), Mr. J. N. Shoolbred, Mr. A. Siemens, Mr. Gisbert Kapp, Mr. T. Eccleston Gibb, and others, took part.

Pintsch's Gas for Railway Carriage Lighting.—Our attention has been called by Mr. W. B. Rickman, Managing-Director of Pintsch's Patent Lighting Company, Limited, to some remarks made by our Scotch Correspondent, in the JOURNAL for the 30th ult., on the comparative value of the Peebles and Pintsch gases for railway carriage lighting. He questions our correspondent's statement as to the capability of the Peebles gas to "stand compression without depositing liquor." Mr. Rickman says that "every gas will deposit hydrocarbon when compressed to 150 lbs.; in fact, this liquid is produced as soon as the pressure exceeds 75 lbs. per square inch, and it increases in a greater ratio with the higher pressure." He adds that "there is no deposit in our gas-receivers under the carriages; and the gas is not affected by condensation in the most severe frosts." Another matter to which Mr. Rickman refers is the cost of the oil used in the Pintsch system, which was stated by our correspondent to be 7d. per gallon. This, he says, is incorrect and misleading, as 3¼d., and even 3d. per gallon, is being paid by railway companies using the system.

Society of Engineers.—As mentioned in the JOURNAL last week, the new President of this Society (Mr. G. A. Goodwin) delivered his Inaugural Address at the first meeting for the current session, held on the 12th inst. It dealt with the present position and practice of mechanical engineering, and contained some remarks on internally-fired gas and oil engines. The many improvements made in recent years, culminating in the use of ignition-tubes, self-starters, better thermal efficiency, and larger powers, were described by the President; and questions such as late ignitions, scavenging, varying explosive charges as against cutting out, coupled engines and compounding, were discussed as far as time would allow. Single-cylinder engines were now, he said, made up to 160 indicated horse power; while multiples went as high as 600-horse power. The consumption of gas had been reduced to 15 cubic feet per horse power. The mechanical efficiency of these engines could be taken as from 80 to 85 per cent. at full power. While in 1860 the thermal efficiency was only 4 per cent., it was now 26 per cent. As an example of the high running powers of gas-engines, the President referred to an engine he had seen where 800 explosions—that was to say, 1600 revolutions—took place per minute. With regard to oil-engines, their action was described, and results of tests carried out by reliable engineers were referred to. The largest oil-engine made was, he said, one of 90-horse power.

CORRESPONDENCE.

[We are not responsible for opinions expressed by correspondents.]

Professor Lewes on the Carbonization of Coal.

SIR,—In Professor Lewes's lecture reported in your issue of the 13th inst., there are several statements made which tend to mislead, and should not be allowed to pass without some notice. The statements referred to relate more particularly to the carbonization of the coal.

Having been engaged for several years experimenting with, and testing, various methods of carbonizing, I have recently completed tests which, in my opinion, largely negative the results obtained by Professor Lewes and his quoted authority (now a matter of ancient history), by means of a stationary "iron" retort.

Professor Lewes states that, "as the temperature is raised, the yield of gas from a given weight of coal increases; but with the increase of volume there is a marked decrease in the illuminating value of the gas evolved." Now, in my latest experiments, the result as regards illuminating power has been the reverse of the learned Professor's experience, as the following comparison between the figures quoted by him and the results now quoted by me will show:—

Professor Lewes's Figures.

Temperature.	Cub. Ft. of Gas per Ton.	Illum. Power. Candles.
Dull red	8,250	20·50
Bright orange	12,006	15·60

My Results.

Dull red	10,630	19·25
Bright orange	15,855	23·60

The specific gravity of the tar in the first instance was 1·100, and in the second 1·220. The coal used was an inferior class of English cannel; and the retort employed was "iron," conical in shape, revolving, and automatically charging and discharging itself. I have worked many tons of coal through it without being troubled in the least with any accumulation of carbon in the retort, or choked ascension-pipes. As to the formation of naphthalene in the service-pipes, caused by condensation, I have never found any therein. That being so, I think I have disposed of the three greatest sources of trouble and loss to the gas manager.

Of course, this is admittedly a very different system of carbonizing coal from the ordinary method dealt with by Professor Lewes, and leaves good scope for comparison and analytical inquiry.

Glasgow, Feb. 16, 1894. LAWRENCE W. NELSON.

MISCELLANEOUS NEWS.

SOUTH METROPOLITAN GAS COMPANY.

The Ordinary Half-Yearly General Meeting of this Company was held last Wednesday, at the Bridge House Hotel, London Bridge—Mr. GEORGE LIVESEY in the chair.

The SECRETARY (Mr. Frank Bush) having read the notice calling the meeting, and the minutes of the last meeting, the report of the Directors, which, with the accounts for the six months ending Dec. 31 last, was given in the JOURNAL for the 6th inst., was taken as read.

The CHAIRMAN, in moving the adoption of the report and accounts, said that the report dealt so fully with the main questions of the half year, that there was practically very little for him to say. There were, however, one or two comparatively outside matters affecting them rather closely; and it would be necessary to deal with them, perhaps, in some detail. The first remark on the report was as to the question of coal—stating that during the half year it had been reasonable in price. He thought, after all that had been said in the Press and at public meetings, particularly during the time of the late Midland coal strike, against companies and corporations supplying gas, in relation to their coal contracts, that it would not be amiss if an authoritative statement were made as to how these contracts were entered into. He might say, at the outset, that the South Metropolitan Company had never put up their coal supplies for competition; they had never asked for public tenders. In the year 1838, the Company began the supply of gas from common coal—having previously made it from cannel; and he believed that from that date to the present year they had had a supply from one colliery with only one break, which occurred some thirty years ago. They had had dealings also with a certain other colliery for more than thirty years without a single break; and other collieries were following on the same lines. They did not "sweat" the colliery owners; they simply asked them year by year at what price they were prepared to supply the Company with coal for the following year. They never made contracts for more than twelve months, and sometimes for a shorter period. When prices were high, they had them for six months. Last year they applied to the contractors at the usual time to state at what price they would supply the Company with coal; and a price was named which was thought by the Directors to be reasonable, and they accepted it without asking for any abatement of the figure. He believed that a little later on other companies obtained about 3d. a ton less. He was a Director of another Gas Company, which dealt with their coal contractors in precisely the same way. There was no justification whatever for the great outcry made against gas companies in regard to forcing down the price of coal, as was so glibly stated by Mr. Pickard and men connected with the Miners' Federation last year. The coal combination which appeared to have been just started—started, too, for the purpose of forcing up the price of gas coal—was a combination they would do their utmost to defeat. He had written to the Company's coal agents to inform the contractors that, if they chose to go into a combination of this kind, it would be regarded as an indication that they did not value the old connection of so many years, and that if they "put the screw on" the Company in such an unfair way, it would be they and not the Company who broke the connection. He did not think, however, that the combination would last long; and he believed that they

would find means of circumventing it. Whatever extra price had to be paid for coal, would not be paid by the shareholders. This was another fallacy. Coalowners looked at the dividends paid by gas companies, and said: Why should we supply them with coal at the rates we have been doing, to enable them to pay such dividends?—ignoring the effect of the auction clauses. The effect, however, of increasing the price of coal had been to raise the price of gas. He was last week at a Gas Company's meeting at which the statement was made that the price of gas had recently been advanced in various places, owing to the action of the Miners' Federation. At any rate, it was perfectly clear that whatever increase had to be paid for coal must come out of the consumers' pockets; and so it was the public who had to pay, and not the shareholders. The Company were happily in the position of being able to pay the full dividend to which they were entitled. Perhaps, he was wrong in saying "the full dividend," because they did not propose to pay the full dividend by about ¼ per cent. They only proposed 13 per cent.; but they saw their way perfectly clearly to be able to pay 13 per cent., even if the price of coal went up. Such an event might involve an increase in the cost of gas, or prevent a reduction in its price; but it would not interfere with the shareholders' dividend at all. With regard to the increased cost of coke, the great Midland strike had not affected them. They had their "turn" the previous year. They were put to serious loss and inconvenience by the strike of the Durham miners in 1892; but in 1893 they were not affected. But as the price of coal in London was raised considerably, it necessitated an increase in the price of coke, which had resulted in their getting about £19,000 more in the half year than they would have received at the prices of the corresponding date. The second paragraph in the report dealt with the cause of the decrease in their consumption. The decrease had been 2·17, or under 2¼ per cent.; and, considering the extraordinary season they had passed through—long hours of daylight, a great increase of sunshine, and no fogs—he thought the shareholders must consider this satisfactory. He would not have been surprised had the decrease in consumption been greater. They had, at any rate, done what they could to extend the business of the Company; and when he stated that during the whole year they had added 11,809 new consumers, he thought the fact showed that the Directors and officers had not been idle. Of course, the great bulk of the new business arose from what were commonly called the "penny-in-the-slot" meters. The Directors found that the working classes were very glad to burn gas if they could have it supplied to them in such a way that they could pay for it conveniently. The demand for meters was so great at one time that they had to stop canvassing for three months, in order to overtake arrears. The average amount paid by each consumer approached £2 a year, including the rent of meters and fittings. With reference to the important paragraph in the report relating to the question of capital, here again one object of stating the matter so fully was to disabuse the public of a great mistake under which they rested as to the dividends paid by gas companies. In connection with this matter, he might mention that he had that morning received a letter from one of their colliery owners, stating that the idea of the owners was to charge a certain price for coal and an additional price for every ¼ per cent. paid by the gas companies above their 10 per cent., or their statutory dividend, as if this had anything to do with the matter. He hoped, however, that this gentleman and other coalowners would understand that the South Metropolitan Company were not paying a dividend of 13 per cent.; for, in regard to about 41 per cent. of their total capital, the interest paid by them was at the rate of only £4 8s. 8d. per cent. per annum. It was a great misfortune that the auction clauses worked in this way. They caused a very wrong impression on the part of the public as to the dividend which the shareholders in gas companies were receiving; and they also stood very much in the way of placing new stock. A man did not like to pay £13 for a £5 certificate, or £1300 for a £500 certificate, which were about the rates at which their own capital was issued. Whether or not any alteration could be made was another question; but he might state that conversions of capital were not new. The railway companies—particularly the Scotch companies—had done a great deal in this direction; and three of the gas companies had already converted their capital into 5 per cent. stock. Three or four years ago, the Bristol Gas Company, which had raised the greater part of their stock by auction, applied to have their 10 per cent. converted into 5 per cent. Then followed the Oxford Company, which was under the sliding scale; and last year the Crystal Palace District Company obtained an Act authorizing them to convert their stock into one uniform 5 per cent. stock. He might state that when these Bills were passing through Parliament no objection was made on this point. In the case of the Crystal Palace District Company, there was considerable opposition on other points. The London County Council and the parishes opposed them very strongly; but neither before the Chairman of Committees in the House of Lords nor before the Committee of either House was the slightest objection raised to the conversion of the capital. He should contend that it was a perfectly fair and just proceeding; and that at present the method of issuing capital was misleading, unjust, and unfair. It is necessary, where the auction clauses were adopted, that the nominal dividend on the capital should be as near as possible to the actual dividend paid. Of course, the statements in the report, and his remarks concerning it, were simply so much information at present; for they were not in a position to say what they thought of doing, or what they imagined could be done. Whatever was done would need the authority of an Act of Parliament; and it was not the time now to discuss the question. If the Directors should at any future time see their way to introduce a Bill for the purpose, they would, of course, as in duty bound, and as required by their Acts, have to submit the matter to the shareholders, and get their consent. The fifth paragraph of the report referred to the manufacturing stations of the Company. At a meeting held last week a comparison was made which might possibly be supposed to reflect a little on the capacity of their Company to meet possible requirements; but he would give the proprietors a few figures on the subject. Last winter their maximum make of gas on one day was 34,110,000 cubic feet; while their maximum consumption was 34,825,000 cubic feet. They therefore made (say) 34 millions, and sent out 35 millions; but they had retorts ready for use which would have increased the make to 40½ millions, which they could have done in the course of a very few days. They had, in addition, plant for making a total of 44 millions; all that was required being the setting of 300 additional retorts. They had retort-houses and everything excepting these 300 retorts, which they had not set because they knew they would not require them last year. The gasholders now in use by them, too, held 45½ millions, or 30 per cent. in excess of their largest day's consumption. He did not think that in the case of the other Company there was so large a surplus capacity as there was with the South Metropolitan Gas Company. Unfortunately, a new experience was coming upon the present generation of gas people. It used to be customary in the gas industry for an agitation to spring up every four or five years. There were agitations in 1850, 1851, 1858, 1859, 1860—followed by parliamentary inquiry—1866, 1867, 1868, and again in 1874 and 1875; but since then they had had absolute peace, which he thought they might fairly attribute to the operation of the sliding scale. There were now, however, mutterings of another storm; and the agitation had started in just the same way as on the other occasions. Meetings were being called in different parts of London—all in the north, he was glad to say—to protest against the price of gas; and comparisons were made between the north and the south of the river, showing that, while in a great part of the north the price charged was 3s. 1d., on the south it was 2s. 5d. per 1000 feet. One need not be much surprised at discontent arising under these circumstances; and the only remedy for removing it was to reduce the price of gas. He had been very sorry to hear, in the comparisons which were made at the meeting he had referred to last week, that it was attempted to show where the difference lay between the two Companies; but not one word was said as to the cause of the difference. It was a very clever accountant's statement, but it showed a total want of capacity for management; and the only other remark he had to make about it was that the whole gas industry of London was suffering because of the want of capacity of managing the business where the gas was being supplied at 3s. 1d. There was no reason why the Company which supplied the finest district in the world should not sell gas as cheaply as it was sold in less favourable parts. With regard to the dividend, they were happily in the position of beginning to build up the funds which had been depleted, owing partly to the strike, but mainly to the high price of coal. They drew largely on their reserve funds in order to avoid raising the price of gas. They reduced their insurance fund from £42,000 odd to £12,000; and Mr. Parkes, who was at that time the Official Auditor, but who had since resigned his appointment, told them that though it was perfectly legitimate to draw upon the insurance fund to meet the expenses of the strike, or to partly meet them, he would require them, if he continued to be the Official Auditor, to build up that fund again. They did not, however, want any requiring. They were quite ready to begin building it up as soon as they could; and finding this half year that they had a respectable surplus, they had added £6500 to the insurance fund, bringing it up to over £20,000. The idea was to continue to add to it a moderate sum every year, until it amounted to a respectable figure again, which he hoped they would see in a few years. Then they also drew very largely on their reserve fund, which at June, 1892—its low-water mark—amounted to £44,000; but that half year they were £8000 short of their dividend. They did not actually take the money out of the reserve fund, because they felt pretty sure that in the succeeding half year they would have a surplus which would enable them to meet the deficiency of the June half year. If, however, they had taken the amount of the deficiency out of the reserve fund, they would have found it reduced to £36,000; but with the proprietors' consent, and foregoing ¼ per cent. of their dividend, it would now amount to over £53,000. They also proposed that in the future they should not pay dividends "up to the hilt," but should add a small amount half year by half year to the reserve fund, in order to place them in a good position to protect the shareholders and the consumers against fluctuations in the price of coal or other things. If in one half year they did not make quite as much profit, the reserve fund would then enable them to make good the deficiency. As he warned them at their last meeting, there was rather a heavy item for law charges; but the expenditure had been in defending themselves against attempts to extort money from them. The only other matter for him to deal with was in relation to their workmen. It cropped up out of the agitation prevailing throughout the country just now in regard to employers' liability. He might say that the Directors of the Company had recognized their obligation to their men to provide for accidents. They held with Mr. Chamberlain that the industries of the country ought to provide for their killed and wounded, He (the speaker) believed the right plan was for the fund to be a joint one—that the workmen and the employers should both contribute to a fund to pay for all accidents—not for just the two or three per cent. that might be caused by the negligence of employers, or the five or six per cent. possibly caused by negligence of fellow-workmen, but to provide for all accidents to which the men might be exposed. He had not been connected with the business all these years without becoming convinced that, of all the distressing circumstances connected with their business, the most distressing might be said to be those cases where a workman perhaps lost his life, or was seriously injured, by an accident for which neither the workman nor any one else was responsible. Some time ago the Directors decided that they would make provision for all accidents. Generally this was 18s. a week during disablement; and in case of fatal accident, they began with not less than 15s. a week to the widow, to be reduced to not less than 10s. a week during life or widowhood. About a year ago, or a little more, they adopted a plan of making inquiries by the workmen themselves into all accidents that took place. A list of the whole number of workmen was made out; and for every accident, a jury of twelve was selected by rotation. The results of the inquiries which had been held had been very extraordinary—in fact, so extraordinary that a good many might decline to believe them. All he could say was that the workmen had been encouraged to express their views with the utmost frankness. They had been asked to say the cause of the accident, and whether it arose from any fault on the part of the Company or plant, or on the part of the workman himself or a fellow-workman; and they had also been asked if they could suggest any means whereby such accidents might be prevented in the future. The men

had shown themselves to be perfectly free, and had made a number of useful suggestions, which the Directors had been only too glad to adopt. Last year they had 90 accidents—happily none of them fatal, and not many of a serious character. The average number of days that the injured men were laid up for was 28; and the total amount paid in sick pay for the 90 accidents was £254 6s., or about £2 16s. per man. Out of the 90 accidents, according to the verdicts of the men themselves (and, as far as the Directors knew, the men had given their unbiassed opinions) 84 were of a kind for which no one was responsible or liable at all; 5 were the fault of fellow-workmen; and one was the fault of the Company—rather more than one, perhaps. The point he wished to make clear was that more than 90 per cent. of the accidents that occurred were accidents for which no one was responsible, and for which no Employers' Liability Bill would make any provision whatever. What, however, was to be done with the 84 out of the 90 cases he had mentioned, if no provision was made for them? These funds were established for the benefit of the workmen. People must not suppose that employers connected with public companies were deficient of human feelings. Canon Scott-Holland, preaching the other day in the City, was denouncing employers in the most unmeasured terms; but the reverend gentleman was talking of matters he did not understand—simply socialistic nonsense to set class against class. What was wanted was to bring employers and employed together to help each other, to work with each other in the same direction—and especially in connection with accidents. He was sure that the course which the Directors had adopted was producing good in minimizing and preventing accidents, and in promoting good-will between employers and employed. In the 90 cases he had mentioned, all the men except two returned to the same work they had been doing before the occurrence; and these two were given somewhat easier work. He felt that the attempts which were being made to separate employers and employed were doing the greatest mischief, and were of the greatest disadvantage to the country. He knew the fact before; but the Trade Union leaders (or so-called Trade Union leaders) in the House of Commons had made the matter pretty clear, for, on the previous night, in the House, Mr. John Burns said "they objected to the co-operation of masters in the establishment and maintenance of insurance schemes," because, as he said a little farther on, "many of the unions and friendly societies connected with the organization of unskilled labourers would no longer be able to exist." Why the trade unionists did not like these arrangements was because they promoted a friendly feeling between employers and employed. If the trade unionists were going to stand in the way of friendly feelings and co-operation between employers and employed, they would be doing a great harm to the country. If the trade unions could not exist in the face of these friendly arrangements, he said let them die. He was not opposed to Trade Unions if they were fair. He could name some of the leaders whom he respected very highly; but they were not blatant demagogues. If they would but act fairly, and look at questions from both sides, no one would be more ready to work with them than the Directors of the Company; but when they tried to set them and their men by the ears, they would adopt every means to attach their employees to them.

Mr. B. LEIGH SMITH seconded the motion.

A brief discussion followed, in which Dr. Drysdale, Messrs. Foster, Coppin, Soden, Mace, and Austin (an employee of the Company) took part. The last-named speaker referred in high terms to the manner in which the workmen were treated by the Company. The workmen's bonus and savings now deposited with the Company amounted, he said, to £34,500; and, in addition to this, the men had invested £5000 in the share capital. He thought this was an indication of the good feeling which existed between employer and employed in the case of the South Metropolitan Gas Company—the shareholding employee having a much stronger interest in the success of the Company than the mere wage earner.

The CHAIRMAN, in reply, stated that, as regarded the "coin" meters, the Directors stopped the canvassing on account of the fact that they were at the time overdone with orders. When they had overtaken these orders, the matter again came up for consideration; and there was no hesitation on the part of the Board in recommencing. The matter had, without doubt, passed the stage of experiment; and the "slot" meters formed a very useful addition to their business. They had now more than 10,000 of the meters fixed, It was rather premature to discuss, at present, the question of the conversion of the stock, as an Act of Parliament would be required for the purpose. Even any conversion as between the "A" and the "B" stocks could not be effected without an Act. He might remind Mr. Soden that the "B" stockholders participated to the extent of 2 per cent. under the sliding scale; the "C" stock's participation was 3 per cent. This was all the difference between the ordinary sliding-scale stock and the "B" stock. The initial price could not be reduced if conversion took place. An impression very often prevailed that the initial figure could be altered; but Parliament could not do this without a distinct breach of faith. Parliament had imposed on them the auction clauses. They had been compelled to issue their new capital by tender or by auction, at rates governed by the initial price; and to lower that would be to reduce the 5 per cent. received on this capital. It would therefore be unjust to put down the initial price; and it would be impossible for the Directors to agree to such a proceeding, for in the last three years they had placed among their consumers about £300,000 on the faith of the initial price. With regard to his remarks about the other Company, any agitation that was got up would embrace the whole of London, and might injure them all. They were perfectly satisfied with the profit-sharing system instituted nearly five years ago; and he might state that the Directors had been so convinced that it was working beneficially both for the men and for the Company, that they had now proposed to the men an extension and an improvement of the system. The old arrangement was to give the workmen 1 per cent. on their wages for each penny reduction in price below 2s. 8d. The price then was 2s. 3d.; and the men had accordingly received 5 per cent. advance on their wages. The Directors had, however, to raise the price; and this brought down the bonus from 5 to 3 per cent., because the average charge for the year was 2s. 5d. The men accepted this very reasonably, and understood it; and the only remark they made was that they would try to get the price lowered again. The whole of the bonus was payable to the workmen in cash; but he might state that 44 per cent. of it had been left with the Company at 4 per cent. Their desire was to make their employees shareholders. But the difficulty was that the men did not like to pay £13 for £5 of stock; they preferred 4 per cent. on the bonus instead of 5 per cent. on the stock. The Directors had therefore said they would increase the bonus by half, and instead of giving them 1 per cent. for every penny reduction in price, would give them 1½ per cent., on the condition that only half of the total was withdrawable, and the other half invested in the Company's stock in the names of trustees. When each workmen had enough invested to entitle him to hold a certificate himself, it would be given to him. He hoped they would soon have pretty well the whole of their workmen shareholders in the Company. There was no doubt that water gas could be made, and was a success. They themselves had tried it; but the plant they put up did not answer their expectations. The Chartered Company, however, had a number of water-gas plants at Beckton; and no doubt they were able to make it successfully. He was rather doubtful, however, if they produced it as cheaply as ordinary gas when coal was cheap. Water gas would be very useful in a gas company's hands in checking the vagaries of coalowners. It was very largely in use in America, where, however, the circumstances were different—coal being dear and oil cheap. In this country, there was cheap coal and dear oil. Still it was in use in Belfast; and in Liverpool and other places plant for manufacturing water gas was being put up, and if the artificial raising of the price of coal went on, other places would follow. With regard to electric lighting, the Directors' policy had been always to do the best they could with gas. The electric light could not compete with gas in price; and there was one advantage, at all events, in having a poor constituency. South London was not rich enough to have the electric light. They would not pay two or three times as much for their lighting by electricity as they could get it for by using gas. The Company had therefore been left practically alone in South London. They were doing everything they could to improve the supply of gas, to enable the consumers to get the most they could from it, and to have it as cheaply as possible. Under these circumstances, he was not afraid of any competition.

The motion was then put, and carried unanimously.

On the proposition of the DEPUTY-CHAIRMAN (Captain T. B. Heathorn, R.A.), seconded by Mr. R. MORTON, the dividend recommended was approved; and resolutions were afterwards passed re-electing the retiring Directors (Mr. J. Ewart and Mr. B. Leigh Smith) and the Auditor (Mr. C. Mortimer).

Votes of thanks were accorded to the Chairman and Directors, and to the officers and workmen; and the proceedings terminated.

BRENTFORD GAS COMPANY.

The Half-Yearly Meeting of this Company was held last Friday, at the Charing Cross Hotel—Mr. HOWARD C. WARD in the chair.

The SECRETARY (Mr. W. Croxford) read the notice convening the meeting; and it was agreed to take as read the report and accounts, of which a summary appeared in the JOURNAL last week.

The CHAIRMAN, in moving the adoption of the report and accounts, observed that he thought the shareholders would be very well satisfied with them. Personally, he considered them satisfactory in every respect but one, and that was the falling off in the gas-rental, which had occurred through causes quite beyond the control of either the Directors or the officials. It had been brought about to some extent by the slackness of trade, by the continued practice of closing shops early (in some cases more than one day in the week), and, more than all, by the unprecedented fine and warm weather during the six months ending December. He believed he was correct in saying that the average temperature of that period was between 2° and 3° higher than in the corresponding months of 1892; while the hours of sunshine increased by no less than 20 per cent. This, of course, made a very material difference in the amount of gas consumed, both for heating and lighting purposes. As to the works of the Company, they were in capital order. The only thing they were doing just now of a large nature was fitting another house with inclined retorts, in place of the old horizontal ones. The Directors were very well satisfied with the inclined retorts they had already adopted; and they found them most efficient and economical—certainly in the saving of a great deal of labour. Referring to the noteworthy differences in the items of the accounts, he first alluded to coal, which, he said, had been supplied, including labour, at a cost of 12s. 11d. per ton, as compared with 15s. in the December half of 1892. This made a difference in favour of the past six months of no less than £6890. The residual products, too, or rather some of them, had been exceedingly good for the Company—he suspected owing, to a certain extent as far as coke was concerned, to the terrible coal strike. That had resulted in giving them a larger amount for this residual by £2290; and they had improved in another important product—ammoniacal liquor—by £1139. As against these increases, the gas-rental had fallen off by about £670; but the meter and stove rental had been augmented. Tar had been bad for the Company in the past half year; but the reason of this was not far to seek, because they had a good and profitable contract during the period ending December, 1892. Then the price of tar was falling; and they had to enter into a contract on less favourable terms than before. The contract, however, had now terminated; and they had a new one which was far more in favour of the Company. He did not think there were any other items that called for special remark; but the salient fact was this: That the balance carried to the profit and loss account was £41,089 for the half year, as compared with £33,382 in the corresponding six months of the preceding year. The simple result was that, after paying the interest on the debenture stock and sundries, they had a balance of £37,759. They required for the payment of their maximum dividends £30,750; so that there was a surplus on the half-year's working of £7009. He might mention that, although the gas-rental had decreased by about 3 per cent., there had been an increase of 133 in the number of meters fixed;

and the stoves had increased much more largely—there being, as compared with 1892, an additional 450 in use. Besides the ordinary meters, they had entered on the experiment of supplying prepayment meters (which the Directors believed would increase the business of gas companies generally, and the adoption of which was advocated by Mr. George Livesey). Already 723 of these meters had been fixed; and the Board were of opinion that they would be the means of getting the poorer section of the population to use gas instead of oil. During the half year, the Directors had had the misfortune to lose a colleague for whom they had great respect (Mr. J. S. Neville); and they had come to the conclusion that they could not do better than appoint his son to fill the vacancy. The Chairman also congratulated the shareholders on the fact that Mr. J. Orwell Phillips (who was unable to attend the previous meeting) had so far recovered his health as to be able to assist the Directors in their deliberations.

Mr. J. Orwell Phillips seconded the motion.

Mr. Thomson asked what was the amount that had been saved on coal during the half year.

The Chairman replied £6893. He added that the Company were getting coal cheap just at the present time; but, as the shareholders were probably aware, there was a "nasty" combination of coal-owners, and the Directors hardly liked to move until they knew what the outlook would be like. If coal were cheap, they would be able to accomplish what they were always hoping to do—that was, reduce the price of gas; but with the existing position of things, they could not do this at present.

The motion was unanimously carried.

The Chairman next proposed the declaration of dividends at the rates per annum of 5 per cent. on the preference stock, 11½ per cent. on the consolidated stock, and 8½ per cent. on the new 1881 stock. He remarked that, after paying these, they would carry over undivided profits to the amount of £21,187.

Mr. Phillips seconded the proposition, which was agreed to.

The retiring Directors (Sir Hugh E. Adair and Mr. Phillips) and the Auditors (Mr. J. W. Field and Mr. M. F. Monier-Williams) were re-elected; and the customary acknowledgment of the services of the Directors and officials terminated the proceedings.

CRYSTAL PALACE DISTRICT GAS COMPANY.

Half-Yearly Report and Accounts.

The following is the report of the Directors of the above Company for the past six months: "The accounts now presented show that the result of the half-year's working gives a balance to the credit of revenue account of £18,968 reduced (as shown in the profit and loss account) to £18,186; being sufficient to pay the dividends of £14,875, and to carry forward the sum of £3311 to the next half year. As compared with the corresponding half of 1892, there has been a decrease of 2·96 per cent. on the quantity of gas sold, but an increase in the sale of coke, tar, &c., of £3151, and sulphate of ammonia of £1166, which, with an appreciable reduction in the cost of coals, has conduced to the satisfactory result shown in the balance-sheet. The Directors going out of office by rotation are Mr. J. Glaisher and Mr. A. T. Layton, who, being eligible, offer themselves for re-election. The Auditor going out of office by rotation is Mr. A. G. Hounsham, who, being eligible, offers himself for re-election. The Directors have to report that in October last Mr. Magnus Ohren, after 38 years' faithful service, was compelled, through failing health, to resign his appointment as Secretary of the Company. The Directors, in consideration of his valuable services, awarded him a retiring pension of £500 per annum; and a resolution confirming this award will be submitted to the meeting. Mr. Charles M. Ohren, who has been an officer of the Company for the past 26 years, has been appointed by the Directors as Secretary; and it will be for the proprietors to fix his salary, in accordance with the provisions of the Companies Clauses Act, 1845. The Directors recommend that a dividend be declared for the half year ended the 31st of December last at the following rates per annum: 5 per cent. on the preference stock, and 5 per cent. on the ordinary stock—amounting to £14,875, less income-tax, of £434." Turning to the accompanying accounts, we gather the following details as to the financial results of the half-year's working: The receipts from private consumers (with gas selling at 2s. 9d. per 1000 cubic feet) were £52,413; and from the 2747 public lamps, £4304—making a total of £56,717. The rent from 12,926 meters amounted to £913; and from 2958 stoves, £391. Regarding the residual products, coke produced £16,292; breeze, £447; tar, £1740; sundries, £5; and sulphate and ammoniacal liquor, £2969—making together £21,455. The small sum of £28 for rents brought the total revenue to £79,506. In the manufacture of gas £47,619 was spent; and in its distribution, £4062. The lighting and repairing of the public lamps cost £994; rents, rates, and taxes absorbed £1471; and the management expenses amounted to £3184. The parliamentary charges were, of course, heavy—reaching the sum of £2793. Bad debts only figure for £209; and some small items make the total expenditure £60,538—the balance of profit being, as already mentioned, £18,968. The capital account shows that the expenditure to June 30 last amounted to £398,794, and that the increase on the nominal amount consequent upon the conversion of the debenture and the 6, 7, and 10 per cent. stocks into an equivalent of 5 per cent. stock, in accordance with the Act of last year, is £202,500. The outlay during the six months was £11,365—thus making a total of £612,659, and leaving £27,341 in hand. From the statements showing the results of the manufacturing operations during the past half year, we learn that 44,674 tons of coal, 263 tons of cannel, and 36,085 gallons of carburine were used; and 457,235,000 cubic feet of gas were produced. The estimated quantities of residual products were as follows: Coke, 539,237 cwt.; breeze, 5219 yards; tar, 449,320 gallons; ammoniacal liquor, 898,750 gallons; and sulphate of ammonia, 288 tons.

The Price of Gas at Accrington.—An announcement has been made at Accrington that the discount on all gas accounts paid before the usual discount days will, commencing with this quarter, be 5d. per 1000 cubic feet, instead of 2½d. as heretofore.

SHEFFIELD UNITED GAS COMPANY.

The Half-Yearly Report.

In the report to be presented to the shareholders of the above Company at their half-yearly meeting on the 12th prox., the Directors remark that the proprietors will naturally expect that the Company, like almost all other gas undertakings, whether in the hands of companies or of municipal authorities, who obtain their supplies of coal from the Midlands, has been greatly affected by the prolonged strike which took place last year; and that they will therefore not be surprised to find it necessary to resort to the reserve fund to make up the usual dividend—the deficiency amounting to £14,723. The Directors recommend that this dividend should be declared. It will be as follows: £6750 on the "A" stock, £10,453 on the "B" stock, £16,325 on the "C" stock, £3023 on the "D" shares, and £704 on the "F" shares—in all, £37,255. After taking the £14,723 from the reserve, this fund will stand at £60,268; being £25,924 below the full amount authorized. Though the quantity of coal carbonized in the six months ending Dec. 31 last was 8472 tons less than during the corresponding half of 1892, the cost was £19,413 more; and there was a slight falling off in the amount realized from the sale of coke and tar, as well as from the fitting department. These figures the Directors consider fully justify the advance made last October in the Company's charges for gas. The £25,000 of 4 per cent. debenture stock which was sold by auction in that month realized a premium which makes the interest the Company have to pay only equal to a fraction over £3 4s. 3d. per cent. per annum on the amount received for it. At the close of the business of the ordinary meeting, the Directors will submit resolutions authorizing the creation and issue, as required, of a further £50,000 of stock. The accounts accompanying the report show that the receipts amounted to £148,356; and the expenditure, to £126,907—leaving a balance of £21,449. The quantity of raw material dealt with was 76,215 tons of coal and 17,620 tons of cannel—together, 93,835 tons. The residual products were: Coke and breeze, 56,444 tons; tar, 6016 tons; and ammoniacal liquor, 2,851,000 gallons.

BRISTOL GAS COMPANY.

The Half-Yearly Report and Accounts.

Reporting upon the affairs of the above Company during the past half year, the Directors have the pleasure of announcing that the revenue account shows a profit of £38,548, as compared with £26,771 for the corresponding half of the previous year. After paying the maximum dividend at the rate of 5 per cent. per annum on the ordinary stock and the interest on the debenture stock, and carrying £10,000 to the reserve fund, a balance of £1268 will remain, which, with £6114 brought forward from the preceding half year, allows £7382 to be carried to the credit of the current account. The gasholder at Barton Hill, it is stated, is rapidly approaching completion, and will shortly be ready for use; and the erection of the new railway viaduct at Stapleton has largely facilitated the deliveries of coal to that station. Respecting the accounts, the capital outlay during the six months was £32,849, divided as follows: New buildings, plant, &c., £27,999; mains and service pipes, £3657; meters, £368; and stoves, £825. The items on the credit side of the revenue account—the figures in parentheses being the corresponding amounts for the December half of the year 1892—are: Gas, £103,487 (£106,703); meter-rental, £1484 (£1415); stove-rental, £547 (£432); coke, £14,356 (£9333); breeze, £688 (£755); tar, £6814 (£7260); ammoniacal liquor, £8353 (£6499); rents, £175; transfer fees, £20; and interest on banking account, £186—the total revenue being £136,113, as against £132,608. On the opposite side of the account, the manufacturing expenses amounted to £82,369 (£86,326); distribution, to £2459 (£3642); lighting and repairing public lamps, to £2897 (£2365); rents, rates, and taxes, to £4056 (£3702); management, to £4701 (£4849); and other minor amounts brought up the total to £97,565, as compared with £105,837. It should, however, be mentioned that in the December half of 1892 £2698 was spent in the restoration of a gasholder at Maudlin Street; £982 in the restoration of a retort-house roof at the Avon Street Gas-Works; and a considerably larger amount was expended in repairs and maintenance. As to the manufacturing operations, 76,349 tons of coal and 12,150 tons of cannel were used. The quantity of gas made is not stated; but, regarding residual products, 51,103 tons of coke were produced, 7161 tons of cannel coke, 7110 tons of breeze, 891,971 gallons of tar, and 1,971,708 gallons of ammoniacal liquor.

BROMLEY GAS CONSUMERS' COMPANY.

Half-Yearly Report and Accounts.

At the meeting of the shareholders of the above Company on the 26th inst., the Directors will have the satisfaction of reporting that the sale of gas, as compared with the corresponding period of 1892, notwithstanding the extraordinarily fine autumn and mild winter, shows an increase of 1,300,000 cubic feet. On the profit and loss account there is a balance of £5813; and the Directors recommend that the usual dividends be declared—viz., at the rates of 11½ per cent. per annum on the ordinary 10 per cent. shares, and 8½ per cent. on the ordinary 7 per cent. shares, amounting together to £5319. Since the last meeting, the Directors have sold by auction 450 shares; being a further portion of the new capital authorized to be raised for the enlargement of the retort-house, new purifying-house, &c., which realized, after deducting the expenses of sale, £7225, or an average of £16 1s. 1½d. per share. They have also raised on debentures of the Company, a further amount of £3900, bearing interest at 4 per cent. per annum. These sums, when added to the £3727 of like additional capital raised in the half year ending June, 1893, make a total of £14,852. It will thus be seen that the Directors have been enabled to postpone the raising of a portion of the estimated cost (£20,000) of the new works; but they anticipate that, in the course of the

spring and summer, it will be necessary to obtain a further £5000, to meet the payments which will become due on the completion of contracts. The works for which this outlay has been incurred, it is stated, have been seriously delayed (and more especially as regards the ironwork) by the unfortunate strike in the coal trade, but will now shortly be completed. Referring to the annexed accounts, it is seen that the capital expenditure during the six months amounted to £13,314, making the total outlay to Dec. 31 £155,309, and leaving a balance in hand of £3870. The total revenue of the half year was £18,671, of which the principal items were: Gas, £13,502; meter-rental, £353; and residual products, £4634. The expenditure totalled to £12,643; leaving £6028 to be carried to the profit and loss account. The working statements show that during the half year 9367 tons of coal (of which 195 tons were cannel) were carbonized; and 93,010,000 cubic feet of gas were produced. The residuals yielded were as follows: Coke, 9367 chaldrons; breeze, 768 chaldrons; tar, 93,375 gallons; sulphate of ammonia, 61 tons 14 cwt.; and 20,000 gallons of ammoniacal liquor were in store on Dec. 31.

PROVINCIAL GAS AND WATER COMPANIES.

From the reports relating to the working of Provincial Gas and Water Companies received last week, we extract the particulars given in the following paragraphs.

Gas Companies.

The revenue account of the Bath Gaslight Company for the past half year shows receipts amounting to £34,016, of which £26,367 was produced by the sale of gas; £540 by meter-rental; £279 by stove-rental; £6558 by the residual products; and the remainder is made up by sundry small items. The total expenditure was £25,341; leaving the favourable balance of £8674, from which the payment of the maximum dividends are recommended by the Directors. The past half year (the report says) has been fraught with considerable anxiety arising from the strike and lock-out of miners at three of the four collieries at which the Company have contracts for coal. At the commencement of the difficulty, the latter had a stock on the works; but, owing to the uncertainty of its duration, coal had to be obtained from other pits then working, at a considerable advance on the contract prices. An increase in the charge for coke, following the high price of coal during the end of the half year, together with a marked advance in the price of sulphate of ammonia and an improvement in the price of tar, gave a satisfactory increase in the receipts for residuals over the corresponding period of 1892. The gas-rental was only a few pounds less than the amount for the second half of the preceding year.

The annual report of the Bishop Auckland Gas Company states that the profit and loss account shows an available balance of £1751, out of which the Directors recommend the payment of a dividend at the rate of 10 per cent. per annum on the original, and 7 per cent. on the additional capital for the half year ending Dec. 31; making, with the interim dividend, a total for the year of 9¾ per cent. on the original, and 6¾ per cent. on the additional capital. With a view to increasing the consumption, the Directors have commenced the hiring out of gas cooking-stoves, and the fixing of prepayment meters, with fittings. It is satisfactory to note that there is an increasing demand for the meters; 85 being in use at the end of the year.

The Directors of the Calverley and Horsforth Gas Company express their regret that, notwithstanding the advance of 5d. per 1000 cubic feet in the price of gas, which took effect on Oct. 1 last, the past half-year's working resulted in a profit of only £1022, as compared with £1496 in the corresponding half of 1892. The total revenue for the six months was £4322, or an advance of £265; but there was an increase in the expenditure of £739, arising chiefly from the higher cost of coal. A dividend is to be paid of 2¼ per cent. on the 10 per cent. stock and 2¼ per cent. on the 7 per cent. stock, as compared with 5 and 3½ per cent. respectively in several previous half years.

Brief allusion was made in our last issue to the report which was submitted for adoption by the Chairman (Mr. F. L. Bagnall) at the meeting of the Chester United Gas Company on the 8th inst.; and this week we are able to notice it at greater length. It stated that the Directors had entered into a contract with Messrs. R. and J. Dempster, for the erection, at the Roodee works, of a gasholder and tank, capable of storing 500,000 cubic feet of gas. The cost of the holder and tank and works connected with it (estimated at about £8000) would be charged to the capital account; and to meet this, the Directors proposed to increase the capital by the exercise of the borrowing powers under the Company's Act of 1880, and by re-borrowing, under their Act of 1858, the sum of £2100, which was paid off in 1887 and 1888. A comparison of the accounts with those for the corresponding half of 1892, showed that there had been an advance of more than £2300 in the cost of coal. This was entirely caused by the strike in the coal trade; and if it had not been for this, there would have been a saving on this item of nearly £800. Another increase was for rates and taxes; the assessment having been more than doubled. The return from residuals exhibited an increase; but there was a diminution of gas-rental, owing mainly to the reduction in price from July last, and which, with the discount allowed for prompt payment, brought the charge down to 3s. per 1000 cubic feet. It was a satisfaction to the Board to report that, while this reduction had been cordially appreciated by their consumers, there was no reason to doubt that, under ordinary circumstances, the Company ran no risk of diminished dividends by reason of the lower price. Under the exceptional circumstances of the year, it would be necessary to resort to the reserve fund to make up the dividends on the ordinary stocks, to the extent of £2112; and the Directors had no hesitation in recommending the payment of the full statutory dividends. The report was adopted. An extraordinary general meeting was then held, at which authority was given to the Board to re-borrow, on mortgages or bonds of the Company, the sum of £2100 previously mentioned.

The profits of the Eastbourne Gas Company upon the working of the concern during the past half year amount to £6381, which, added to the balance brought forward and £85 received for interest on current account, gives a total of £14,686. The Directors propose to place £1000 to reserve and £500 to an insurance fund, which will leave £13,186 available for division. They recommend that dividends be declared at the rate of 13 per cent. per annum upon the £20,000 original, and also upon the £12,490 "C" shares, and at the rate of 10 per cent. upon £65,000 "B" shares, which will absorb £5362, and leave £7824 to be carried forward.

It is reported by the Directors of the Elland Gas Company that during the past year the paid-up capital has been increased by the issue of £7760 new 4½ per cent. preference shares, upon which the net amount of premium realized was £1250. The expenditure on capital account during the twelve months was £6956. The alterations and extensions of the works being now completed, the Directors do not contemplate any further capital expenditure for this purpose for some time. The profits, including the balance brought from 1892, amount to £3184. An interim dividend at the rate of 12s. per share was paid; and the Directors now recommend that a dividend of 8s. per share upon the ordinary capital be declared for the past six months—making 10 per cent. for the year. In order to meet this, £636 will be transferred from the reserve fund; leaving the amount of that fund at £5085.

At the meeting of the Ipswich Gas Company yesterday, the Directors reported a balance, with £3129 brought forward, of £11,878 on the working of the past year. Of this amount, £4227 had been employed in the payment of an interim dividend; and the Directors recommended a further dividend to make up 11½, 9, and 8½ per cent. on the "A," "B," and "C" stocks respectively. This left a balance of £3337. There was an increase in the revenue, and a decrease in the expenditure last year. Coals came to less; but repairs to works cost more—caused principally by the thorough overhauling and repair of one of the gasholders. By the introduction of "penny-in-the-slot" meters, 500 new consumers have been added to the Company's books; and orders for 300 more meters are in hand. The quantity of coal carbonized last year was 19,962 tons 16 cwt. The residuals produced were: Coke, 12,227 tons 2 cwt., of which 4286 tons were used; breeze, 700 tons; tar, 201,766 gallons; and sulphate of ammonia, 194 tons.

The profits of the Mirfield Gas Company for the half year ending Dec. 31 amount to £1917; and the Directors recommend the usual dividend of 10 per cent., which will necessitate the taking of £232 from the undivided balance. Contracts have been entered into for a new gasholder and additional purifiers, at a cost of about £6000; and to meet the outlay upon these, the Directors propose to issue 500 new £10 shares.

Addressing the shareholders of the Newport Gas Company at the half-yearly meeting yesterday week, the Chairman (Mr. E. J. Phillips) stated that the results of the past six months, owing to the dryness of the early part of the period and the coal strike, were not so good as anticipated; and the revenue showed a decrease in nearly all departments. Owing to the coal strike, the Company had to purchase coal at increased prices; and this proved to be of inferior quality, and produced less gas than their ordinary coal. They had spent in laying new mains £230 more than in the corresponding half of 1892—in all 1200 yards having been laid in the six months. There had also been a loss on the public lamps; while the rates and taxes had largely advanced. In order to pay the usual maximum dividends, the Directors recommended that £300 be taken from the profit and loss account; they preferring to take this course to raising the price of gas. They still had a large balance on the depreciation account; and, in addition, there was £9000 invested in Consols. During the half year, £10,140 had been paid on account of the contract for the new gas tank. The report was adopted; and the maximum dividends were declared.

At the meeting of the Poole Gas Company, Limited, yesterday week, the Directors were in a position to report that, notwithstanding the reduction of 3d. per 1000 cubic feet in the price charged to private consumers during the past six months, there was a slight increase in the profits—the balance on the working being £1230, as compared with £1209 in the corresponding period of 1892. This enabled the Directors to recommend the payment of the maximum dividends (less income-tax) upon the whole of the shares. The capital account showed that £460 had been raised during the six months by the issue of 46 of the "C" preference shares.

As stated in last Tuesday's issue, the shareholders of the Scarborough Gas Company met on the previous Saturday to receive the report of the Directors on the working of the Company during the past half year. Mr. B. Fowler, J.P., who presided, moved the adoption of the report and accounts, and stated that during the six months there had been an increase on the revenue account of £831, as compared with the corresponding period of 1892. This was made up by £522 increase on the sale of gas, £284 increase on residuals, and about £37 on stove and meter rental. The expenditure was £404 higher; and this was accounted for chiefly by the large quantity of coal used and gas made—nearly 800 tons more coal having been carbonized. According to the balance-sheet, there was a sum of £1400 to be carried forward. The increase in the quantity of gas sold to private consumers was 7,218,200 cubic feet; but against this there was a decrease from public lighting of 1,498,000 cubic feet, which the Corporation in their wisdom had saved by turning out many of the lamps at midnight. This had reduced the consumption by 1,500,000 cubic feet; and therefore the net increase was 3,779,799 feet. This, he thought they would all agree, looking at the anxious time they had passed through, was very satisfactory. The Company had lost some good customers by the introduction of the electric light; but they were pretty certain that they could spread their business very much in cottage property, by the introduction of prepayment meters. Referring to the coal strike, he said that, for something like four months, it had caused the Board a great deal of anxiety and expense, as it was no pleasant thing to be working from hand to mouth when they were using something like 100 tons of coal per day. If they looked at the balance-sheet, they would see that the Company had come out of the period as well as any company, and much better than they expected. The Chairman then alluded to their late respected Manager (Mr. W. J. Moon). For upwards of twenty years, he said, they had met him at the meetings of shareholders; but his health gradually failing, they had felt bound to appoint a Sub-Manager. On

Mr. Moon being obliged to resign active work in September last, the Company had retained his services as adviser. He had been a most faithful servant; and if any man had the interests of the Company at heart, Mr. Moon had. Mr. Holliday had been put in his place; and the way in which he had taken charge of the works at the anxious time during the coal strike, made the Directors feel confident that he was the right man in the right place. The report was adopted.

The annual meeting of the Shanklin Gas Company was held last Wednesday week—Mr. George Garnett presiding. The report of the Directors stated that the balance of the profits on the year's business amounted to £1206; and from this the Directors recommended the declaration of a dividend of 8 per cent. on the original shares, and £5 12s. per cent. on the new issues. This was agreed to.

The Directors of the Yeadon and Guiseley Gas Company report that, as the result of the working during the half year ending December last, they have a disposable balance in hand of £1202; and they recommend the payment of the maximum dividends at the rates of 10 and 7 per cent. During the six months, a small amount of capital has been spent in extensions; and at the end of December, the total outlay on the works was £43,577.

Water Companies.

The shareholders of the Colne Valley Water Company met at the Charing Cross Hotel last Tuesday, to receive the Directors' report and the accounts for the half year ending Dec. 31 last (see *ante*, p. 209). The Chairman (Mr. J. R. Hollond) moved their adoption; and, in doing so, stated that the increase in the water-rates and meter-rents for the past twelve months was £1234; the total for 1893 being £14,097, as compared with £12,863 in 1892. This was the most satisfactory advance they had had. In 1890, the increase was £462; 1891, £675; 1892, £808; and 1893, £1234—making a total of £3179 since 1889. The new supplies laid on during the half year numbered 146. The quantity of water pumped in the same period was 172,500,000 gallons, as against 161,500,000 gallons in the corresponding period of 1892; the consumption per head per day in both periods being 21 gallons. The new well which they were sinking had been pushed forward; and the Directors had every reason to believe their anticipations as to the amount of water they would get would be fully realized. On this occasion it was proposed to increase the dividend by ¼ per cent. Up to the end of 1882, they paid no dividend. But in 1883-4 1 per cent. was paid; and from that time they had gradually moved forward, until now they proposed a payment at the rate of 3¾ per cent. Mr. C. E. Keyser seconded the motion, which was carried. Resolutions declaring the dividend recommended, and re-electing the retiring Directors and Auditors were also passed. An extraordinary meeting was then held for the purpose of considering the provisions of the Bill now before Parliament to authorize the Central Middlesex Water Company to sell a portion of their district to the Colne Valley Company. The Chairman explained the provisions of the Bill; and, in answer to inquiries, he said the amount they were to pay for the area in question was £10,250. The existing water-rates would pay 4 per cent. on the capital, after deducting the working expenses. Besides the district, they would take over a service reservoir of 1 million gallons capacity and the pipes as laid. A motion approving of the Bill was agreed to.

According to the report of the Directors of the East Worcestershire Water Company, during the half year ending Dec. 31 new supplies were laid on to 142 premises; making the total at that date 3251, in addition to which the village of Rednall has been supplied, under an agreement with the King's Norton Rural Sanitary Authority. Extensions of the mains have also been made to Rednall, Tardebigge, and Sidemoor, near Bromsgrove. The Directors have authorized the sinking of a second borehole, from which they will be able to draw water, in case of need, while the pumps in the present well are being still further lowered. The accounts show a net profit of £954. The Directors have decided to start a reserve fund by transferring from the balance of revenue brought forward, after payment of the last dividend, the sum of £577; being 1 per cent. upon the total outlay on the works. After this provision, the balance to credit of revenue account will be £1678, which it is proposed to carry forward to the next accounts.

The revenue account of the Faversham Water Company for the past year shows that the total income was £1916; and the balance of profit, £1318. From this a dividend of 9 per cent. has been declared, without deduction for income-tax.

The report of the Directors of the Newcastle and Gateshead Water Company for the year ending Feb. 1 is, as might have been expected, seeing the difficulties they have had to face during that period, a most interesting one. Having referred to the exceptional drought, the report states that, as early as the month of June, the Directors deemed it prudent to have recourse to the River Tyne at Wylam from which to pump the water required for manufacturing purposes, and so reserve the reservoirs for the water needed for domestic use; and this entailed a heavy expenditure. In view of the continued absence of adequate rainfall, they have thought it expedient to considerably increase the pumping power at Wylam; and the additional works will be ready (should the necessity arise) for use within the next two months. During the year, considerable progress has been made with the filter-beds at Whittle Dean. Two of the beds and one of the pure-water tanks have now been brought into use; and a third bed will be utilized for filtering the water by the end of the present month. As to the Rede works, the Company have been accumulating large quantities of material, and have also been making progress with the laying of the line of pipes connecting the proposed reservoir with the existing works. The experience of the past season has caused the Board to reconsider the advisability of proceeding with the construction of the small reservoir authorized by the Act of 1889; and the conclusion arrived at is that it would be in the interest both of the Company and the public to abandon the small reservoir and to build a large one to hold 2000 million gallons. This will increase the storeage capacity to 5000 million gallons; and for accomplishing this, a Bill is being promoted in the present session of Parliament. Allusion is also made to the other powers sought in the Bill; and then, passing to the accounts, the Directors observe that, although the revenue shows a progressive increase, the balance is lower than in the previous year, in consequence of the heavy outlay on pumping. In view of the possibility of this exceptional expenditure being continued during the present year, they recommend that the available balance of £42,383 should be appropriated to the payment of the usual dividend on the preference stock, and at the rates of 8 per cent. on the ordinary stock, and £5 12s. per cent. on the 1876 stock. After paying these, £8847 will be carried forward.

The report and accounts which were noticed in the JOURNAL for the 6th inst. were submitted at the annual meeting of the South Hants Water Company last Friday week, by the Chairman (Mr. W. E. Darwin, J.P.). In the course of his remarks, he said that the sum available for distribution was £4947; and the gross profits were £5699. Regarding the latter, the amount received and due for water supplied was larger than the previous year by £509; and this, in spite of the fact that the South-Western Railway, which had been large consumers at Eastleigh for two years, had taken less water by some £400 value. This indicated that the concern was going ahead satisfactorily. The reason why the amount available for dividend was less arose from the fact that they only brought forward £204, as against £416 in the former year. As to the future, there was an estimated increase in the annual rental for the coming year of £626; and he was glad to say that, with the exception of one year, when it was £870, this was the highest since the Company had been in existence. Having given an explanation as to the payment of the dividend, which, with the interim dividend, made up 6 per cent. on the old shares, and about 4¼ on the 7 per cent. shares, the Chairman said it was proposed to carry over £500 towards a reserve fund. The Company had now been working some 16 or 17 years; and the shareholders would agree this was a wise step. Last summer they pumped 187,750,000 gallons of water, as compared with 162,250,000 gallons the year before. They were proposing to erect a new storeage reservoir; and they had also works in hand at Michelmersh. The report having been adopted, a special meeting was held for the purpose of considering the Bill which had been promoted by the Directors, and by which it was sought to increase the capital by £80,000, and to supply various districts with water. The Chairman briefly explained the object of the Bill, and said, though they did not intend to spend so much capital in the near future, they wished to avoid the expense of having to apply to Parliament again for a long time. The Bill was approved.

The half-yearly meeting of the Stockport Water-Works Company was held last Friday week, under the presidency of the Chairman (Mr. G. H. Hill, M.Inst.C.E.). He stated, in the course of his remarks, that the extraordinary expense caused by the late drought—£2184—had been responsible for a dividend of 4½ per cent. this half year, as compared with 6¼ in the preceding half year. He considered the Company, remembering all circumstances, to be in a very satisfactory condition. The report was agreed to.

The report of the Directors of the Woking Water Company for the half year ending Dec. 31 last, together with the accounts for the whole year, has been issued. The former states that the total expenditure to date on capital account has been £75,250. The revenue for the year has been £5241; and the expenses, £1969—the balance carried to profit and loss account being £3272. The amount available for division is £1666, out of which the Directors recommend the payment of a dividend at the rate of 4 per cent. per annum for the six months, free of income-tax. This will absorb £1257; and after writing a further sum of £139 off preliminary expenses, and paying the final arrears due to the Directors (amounting to £109), the sum of £160 will be left to be carried forward. With regard to the works, it is mentioned that new pumps and engines are being erected at West Horsley, which will enable the Company to derive the full benefit from the large additional source of supply which they have obtained there.

Stafford Electric Lighting Scheme.—It was reported at the last meeting of the Stafford Town Council that the Local Government Board had sanctioned the borrowing of £20,000 for the purpose of installing the electric light.

Sales of Shares.—Last Wednesday, 25 £10 paid up shares in the *Bridlington Gas Company* were sold by auction—10 at £23 15s. each, and 15 at £24.——On the 7th inst., 15 £10 shares in the *Fisherton Anger and Bemerton Water Company* were sold at Salisbury at £17 and £17 2s. 6d. each.

Effect of Cutting Off Gas at Burnley.—Mr. Lister Woodhouse, the Borough Treasurer of Burnley, in a report as to the finances of the borough and the compounding of rates, says that persistence in cutting off the gas of consumers who do not pay their accounts has already reduced the outstandings to one-third of the amount owing two years ago; and the gas department has not now to take action in one-fifth of the cases necessary at first.

The New Conveyor Company and the Arrol Foulis Retort-Stoking Machinery.—We understand that Mr. Gilbert Little, the Managing Director of the New Conveyor Company, Limited, has been appointed by Sir William Arrol and Co., of Glasgow, as their agent in England for the Arrol-Foulis machines; and last week Mr. Little arranged appointments for several engineers and managers from England to see the Arrol-Foulis system at work in Glasgow.

Domestic Water Supply by Meter at Rugby.—The Rugby Local Board have passed a resolution to the effect that the Board are prepared to supply water for domestic purposes by meter; the price to be charged to be such as will not in the opinion of the Board cause a rise in the amount to be paid by others who prefer to pay by rate. In order that there may be no doubt as to the legality of this step, the Clerk has been requested to take Counsel's opinion in regard to it.

The Gas Examinership for Bromley.—A local correspondent writes: "Notice has been given that when the term of Dr. Rideal's appointment as Gas Examiner at Bromley expires, the Local Board will consider the question of appointing an examiner who resides in the locality, so that the gas may be tested at any time. This action is apparently due to the reports of Dr. Rideal being invariably favourable to the Gas Company. But how a resident examiner could humour the Local Board by making an adverse report, when the condition of the gas is otherwise, is a problem which only a Local Board can solve."

SOUTHWARK AND VAUXHALL WATER COMPANY.

A Special General Meeting of this Company was held last Tuesday, at the Offices, Southwark Bridge Road, to consider a Bill proposed to be introduced into Parliament, authorizing the Company to acquire lands, construct additional works, and raise more capital. Alderman Sir H. E. KNIGHT was in the chair.

The SECRETARY (Mr. Alfred Jelley) having read the notice calling the meeting,

The CHAIRMAN said it would be remembered that the Royal Commission which completed their labours last year presented a very valuable report—a report arrived at by a body of gentlemen all eminently qualified to deal with the subject referred to them for inquiry. Their report thoroughly substantiated the position of the Metropolitan Water Companies, not only in regard to the quality of the water they supplied, but also to the quantity that was to be obtained within a reasonable distance of London, notably from the River Thames and from wells in the valley of the Thames. The Commission having so reported, and the Water Companies being thoroughly in accord with them, the Directors felt it very desirable indeed to carry out, at the earliest possible moment, the recommendations of the Commissioners. Among other matters placed before the Commission were schemes for the storeage of water in the valley of the Thames. Two of these schemes in the Upper Thames the Commission discarded altogether, as not likely to be advantageous, and perhaps also faulty in construction; but a scheme was submitted to them by Mr. Hunter and Mr. Fraser for the erection of storeage reservoirs at Staines, in the valley of the Thames. This scheme the Commissioners thought was a good one, as far as the construction of reservoirs and the provision of storeage were concerned. Of course, they did not say that Staines was the only place were such works should be carried out, but that it was one of the places, particularly having in view also the importance of keeping up the flow of the water in the Thames as far as possible—that was to say, that wherever storeage reservoirs were constructed, they should be as near as possible to the intakes of the Water Companies. Acting upon this report, the Directors very carefully considered the question. He might remind the proprietors that their Company was referred to by the Royal Commission as the one that was the worst off for storeage of any of the London Companies. The Directors knew this perfectly well; but they had had so much to do in the construction of works for the past fifteen or twenty years, that they had not been able to turn their attention to the important question of storeage, as other Companies had been in a position to do, although they made a beginning two years ago with the construction of a large storeage reservoir which would hold very nearly 100 million gallons of water. This was now well on in construction; showing that the Directors were perfectly alive to the importance of storeage long before the appearance of the report of the Royal Commission. It was their desire to carry out with the utmost good faith the recommendations of the Commissioners; and with this view they had cast about in order to discover the best possible spot, economically and as regarded efficiency of service, for their projected new works. They found that, if they constructed reservoirs at some distance up the river, before they could get a single gallon of storeage, they would have to provide a very expensive conduit to bring the water down to their works. In their case this conduit would cost about £20,000 a mile; and if they went seven or eight miles up, they would have to expend more than £100,000 before they could obtain storeage to the extent of a gallon. This was a very strong fact; and it brought home to the Board of Directors the absolute necessity for fixing their works as near as possible to the present intake, also bearing in mind the view of the Royal Commission as to the importance of the flow of the Thames being kept in. They had therefore decided to construct two large reservoirs. [The Chairman indicated the positions on a plan.] The land for one already belonged to them; but that for the other they would have to obtain. The advantage of this proceeding was that it brought all their works together; and they would possess a splendid and complete range of works extending for nearly a mile along the banks of the Thames at Hampton. The whole of the storeage they would have from the three reservoirs would approach 400 million gallons. The Royal Commission recommended that the Companies should have at least 15 days' consumption of water stored; and if they took their own consumption at 30 million gallons a day, and multiplied the 15 by 30, they would see that a storeage capacity of 450 million gallons was required to meet the recommendation of the Commissioners, towards which, as he had explained, the works already referred to would provide 400 million gallons. By the construction of another reservoir in their district, to which he was about to refer, they would have storeage for some 500 million gallons. For these reasons and purposes, the Directors had promoted a Bill in Parliament asking for authority to carry out the projected works. He had not a plan by means of which to show them the other reservoirs which he was about to mention; but they found it was desirable—necessary, even—that they should have a larger quantity of filtered water stored in their district. For this purpose they were asking Parliament for power to take an area of land at Nunhead, behind the land they already possessed there, on which they would construct another covered reservoir, with a capacity of something like 60 million gallons. This reservoir and the others to which he had referred would give them the total capacity they required in order to meet the reasonable report of the Royal Commission, and to put themselves in a proper position to supply their district with that high quality of water which they had been furnishing for many years past. They also sought for powers in their Bill to construct a large area of filter-beds. Some years ago, when they were before Parliament, on the evidence they gave then, and on the statements they made, they felt it was desirable to discontinue their works at Battersea. No doubt, these works were very well when they were first constructed; but since then a neighbourhood had sprung up around them, and circumstances had arisen which made it very desirable that the filters there should be removed. They could not, however, go from Battersea without constructing a large area of filter-beds elsewhere. Another advantage arising from closing the Battersea works would be that they would save considerably in working expenses, and get a large area of land—between 40 and 50 acres, he believed—which they would be able to sell at a price that would give them a very large amount of money to take the place of working capital. In the future, therefore, when this land was sold, they would be able to carry out works with the capital thus obtained. Referring to the plan already mentioned, he observed that the proprietors would see a field which was divided into filter-beds. This would give 7 acres of filters; and just above, on the opposite side, there were three spaces, which would give them a further 3 acres of filters. These 10 acres of filters were to take the place of those at Battersea. They had already a range of nine filters, six of which they had just completed; and they had been doing their work thoroughly. With the other acreage they had on this ground alone, they would have 26 acres of filters. It would be a splendid range of works, and would be very much to the benefit of the Company. In order, however, to construct the new works, they required more capital; and they had therefore included in the Bill provisions to raise it. They would also have to put up extra engine power at Hampton to take the place of that at Battersea. They had consequently inserted clauses in the Bill for the erection of greater engine power at Hampton, in order to carry the water (which would all be filtered there) from that station into their district; and they intended to follow out the principles adopted on their last erection of engines. He had now given the proprietors an outline of their scheme as regarded their proposed works; and it had been arrived at only after the most careful attention. It was one which they felt every confidence in advising the proprietors to accept and authorize the Directors to go on with. The works mentioned would take five years or more to complete. But they would construct them as speedily as possible; and he believed that they could so arrange matters that they would be able to carry out the works without the least fear, as far as he could see, of jeopardizing the financial position of the Company as regarded dividend powers. In fact, after they had moved away from Battersea and constructed their new filters, he believed—and he was speaking on the advice of their Engineer—that there would be such a considerable saving in their working expenses that the prosperity of the Company would be materially added to. They had three debenture stocks bearing 4, 4¼, and 4½ per cent. Their 4 per cent. debenture stock was very large in amount, and would be much larger; but the Stock Exchange had declined to give them a quotation for it, although they had a quotation for the two other stocks. It was detrimental to their interests that there should be no quotation for the 4 per cent. stock; and as they were going to Parliament, they had thought it advisable to take powers to consolidate the three stocks into one 4 per cent. stock—giving the holders of the other stocks an additional amount, so as to yield them the same return which they received at present. When the Richmond people obtained their Act for making their new weir, they had powers materially increasing the assessments. This Company's mains passed through Richmond, although they did not supply a gallon of water to Richmond, except to the Corporation; but their mains had been doubled for assessment purposes, and they paid double rates. This was simply monstrous: and as they were going to Parliament, they had put in a clause to exempt their property from such rating as unfair. He had now explained the whole purport of the Bill. It was essential that the works he had mentioned should be constructed; and he thought the proprietors, with the experience they had had of the Directors in the past twenty years, might trust them not to embark on anything that was likely to imperil the prosperity of the concern. He concluded by moving a resolution approving the Bill, "with or without any modifications which Parliament may require or permit, and which the Directors shall approve."

Mr. C. M. VIALLS seconded the motion.

A SHAREHOLDER asked what capital was proposed to be raised.

The CHAIRMAN: £750,000.

Dr. CHESSHIRE thought this amount was very large; and he asked if the Directors could not manage with a much smaller sum. He gave the greatest credit to them for their desire to benefit the proprietors generally; but, in connection with the contemplated expenditure, they had also to bear in mind the London County Council, with their ideas of acquiring tramway companies and such concerns as their own, he supposed, at the price of old iron. He suggested whether it would not suffice for their purposes to raise £300,000 or £400,000, and to obtain the balance of their requirements from the sales of land.

The CHAIRMAN assured Dr. Chesshire that his views would be entirely different if he were as fully acquainted with the position as the Directors were. They had studied the greatest possible economy; and they proposed to undertake the smallest amount of work which would put them in the position of complying with the report of the Royal Commission. They had never lost sight of the financial position of the Company; but they had now only proposed a modicum of work that was necessary to be done in the next five or seven years. The works would be carried out with every economy.

The motion was carried with one dissentient; and the proceedings then terminated.

The Supply of Water to Ellesmere from the Vyrnwy Works.—The Ellesmere Local Board have decided to apply to the Local Government Board for sanction to borrow £3000 with the view of constructing the necessary water-works for procuring a supply of water from the Vyrnwy pipe-line of the Liverpool Corporation.

Birkenhead and the Electric Light.—A report was submitted to the Birkenhead Town Council at a recent meeting with reference to the steps to be taken in regard to the carrying out of the provisions of their Electric Lighting Order; the principal recommendation being that Mr. J. N. Shoolbred should be appointed as electrical adviser. The adoption of the report was moved by Alderman Deacon, who stated that the Committee having the matter in hand had been informed that they could make a beginning with a capital of £14,000 or £15,000, which did not include the value of land or professional services. Although at first the undertaking might not be profitable, it was thought that a long time would not elapse before it would begin to pay expenses. The report was adopted.

PRESENTATION TO MR. JOHN HUTCHINSON.

Last Wednesday evening, the workpeople in the employ of the Barnsley Gas Company celebrated a double event in the career of their esteemed chief, Mr. John Hutchinson, Secretary and Manager of the Company—viz., the attainment by Mr. Hutchinson of his 71st birthday (on the 7th inst.), and the completion of his 41st year of service. This they did by a complimentary dinner and by a handsome presentation, in the form of an oil portrait accompanied by an illuminated address and an album. The gathering took place at the Company's offices; and, including the members of Mr. Hutchinson's family and a few friends, there were about 120 present. The initiation and carrying out of the arrangements for the function were in the hands of a Committee of the employees, under the presidency of Mr. Reuben Topham, the oldest workman, who occupied the chair. The painting—executed by Mr. Witham, and a most excellent likeness—occupied a conspicuous position in the room, and was greatly admired. The address was in the following terms: "We, the undersigned employees of the Barnsley Gas Company, desire your acceptance of the accompanying portrait as a token of our esteem. We feel honoured in the fact that we have as Manager of the above-named Company one who has completed a longer period of service in one undertaking than any other Gas Company can record; and we feel assured that whilst having fulfilled your duty to the Gas Company, you have also merited the respect and good wishes of your obedient servants." The address was signed by the members of the Committee, and by the subscribers, 93 in number.

After dinner, the loyal toast having been honoured, the Chairman made the presentation in a few appropriate remarks. Mr. J. Hepworth, of Carlisle, then proposed the toast of the evening—"The Health of Mr. John Hutchinson." He said that for upwards of forty years Mr. Hutchinson had gone in and out among the people of Barnsley; and to have won their confidence and esteem, as well as that of the Directors and shareholders of the Gas Company, and of the workpeople, was a matter which must afford him the greatest satisfaction. It had been his (Mr. Hepworth's) pleasure to know Mr. Hutchinson for more than a quarter of a century in connection with the profession to which they both belonged. They looked upon Mr. Hutchinson as one of the founders of that profession—he was one of the few grand old men still left to them; and he (the speaker) knew of none who so commanded the esteem and affection of his colleagues. He was a Past-President of the Manchester District Institution of Gas Engineers, and was also one of the three founders of what was now The Gas Institute, for which he had done yeoman's service—having acted on its Council, and served it in more ways than he (the speaker) could enumerate. No man could have had to do with a big concern like a gas company for more than for forty years without having to encounter numerous difficulties; and for Mr. Hutchinson to find himself so highly esteemed by a large body of workpeople like that assembled to do honour to him, spoke volumes for the good relationship which existed between them, and showed that there was a disposition to look fairly and squarely at matters connected with employers and employed from both sides. Mr. Hutchinson was worthily represented by sons who had in some cases already made their mark in their own line; and he hoped there might long be Hutchinsons to uphold the name and fame of the present Mr. John Hutchinson. They had a great inheritance, of which they ought to be proud; and he trusted they would hand it down unsullied to the next generation. They all hoped that Mr. Hutchinson would be spared for many years to enjoy the esteem and affection of those about him, and that, when his sun did set, it would set as on a calm summer's evening, without a cloud, but with the prospect of a rising in a world where there would be no need for gas, as there would be "no night there." Mr. Hepworth's remarks were followed by loud applause; and the toast was most enthusiastically drunk, with musical honours. Mr. J. Charlesworth (foreman of the works at Old Mill) and Mr. J. Land (chief of the service and main-laying department) followed with short addresses. Mr. Hutchinson, on rising to respond, was received with loud and prolonged cheers. He excused himself from making a long speech, as he had been in poor health. The very handsome manner in which they had poured honours upon him had quite upset him. They must take the will for the deed, if he was not able to adequately acknowledge their great kindness. This was the proudest day of his life; and he thanked them most sincerely, and assured them of his heart's best wishes. Cheers having been given for Mrs. Hutchinson and "the youngsters," as well as for Mr. Hutchinson, the toast of "Success to the Barnsley Gas Company" was proposed in an interesting and racy speech by Mr. C. E. Jones, of Chesterfield. Mr. W. W. Hutchinson responded, and referred to the past six months as having been a trying time for the Company. They, however, had not, like the great majority of gas companies, raised the price of gas, but had given to their customers the benefit of such foresight in the management as the Directors and the officials had been able to exercise. They had a certain supply of coal on hand when the strike began; and during the whole of the strike, they did not have an ounce of Durham coal. Other toasts followed, enlivened by songs, &c.; among them being a metrical address to Mr. John Hutchinson, read by Mr. J. C. Sutcliffe.

Proposed Acquisition of the Worksop Water-Works by the Local Board.—After debating the question for a considerable time, the Worksop Local Board have decided, subject to the approval of the ratepayers, to purchase the plant of the Worksop Water Company.

Village Lighting by Electricity.—Last Tuesday night, the village of Great Missenden, Bucks, was for the first time lighted by electricity. A 15-horse power steam-engine drives a small dynamo which supplies 15 lights of 32-candle power each. The current is on the low-tension system; and the wires are carried on plain wooden posts. The charge for keeping the lamps going up till half-past ten o'clock on dark nights will, it is stated, be only £15 per annum. The Company who have introduced it expect a considerable demand for the light for domestic purposes; and they will also supply it for cooking.

THE PROPOSED DURHAM AND NORTHUMBERLAND COAL ASSOCIATION.

The statements which have recently appeared in the public press opun the subject of the formation by the colliery owners of Durham and Northumberland of a "Sales Association" have, we learn, been "unauthorized, inaccurate, and misleading, besides being premature." The time has, however, now come when, in the opinion of those primarily interested in the matter, an official statement of the views they entertain should be made; and for this reason the following information is being communicated to the press.

"Colliery owners of the county of Durham representing nearly 80 per cent. of the output of the county, together with those interested in similar classes of coal in the county of Northumberland, have from time to time during the past two months conferred for the purpose of ascertaining whether, as regards all descriptions of coal and coke, some judicious organization cannot be adopted to diminish the evils which are commonly supposed to arise from unrestricted and unorganized competition, of which perhaps the most important are the great variations in price to which the trade is now subject. They have come to the conclusion that the object is one worthy of a serious attempt; and they contemplate the formation of an Association to endeavour to accomplish it.

"At the same time they are not unmindful of the fact that fluctuations in price, even of very large extent, depend upon circumstances which are extremely obscure, very difficult to foresee, and perhaps impossible to prevent. The Association will seek to confine its operations within those strictly legitimate limits which govern any well-managed industrial enterprise; and it is hoped that the magnitude of the interests involved will permit it to form a better judgment as to the course of trade than can be done by any single member. By this means, it is thought that something may be accomplished to prevent the extreme fluctuations which are prejudicial to all connected with this most important branch of industry, which may indeed be said to lie at the root of the national prosperity. It is anticipated also that, without endeavouring to thwart the natural course of trade and of prices, a careful and continuous survey of the market—such as can be undertaken by a large combination of owners—may curtail, if not entirely prevent, those losses to which the trade has from time to time been compelled to submit.

"Whilst the owners are of opinion that much misconception exists in the minds both of the workmen and of the general public as to the effects produced by underselling and by long contracts, they recognize the advisability of taking measures to reduce to a minimum grounds of complaint of which much has been heard in recent times. Anything they can do to prevent the recurrence of disputes, which of late years have been too frequently a cause of grave industrial disturbance, should, they think, be received with approval by the workmen and the public alike.

"The intended Association will deal with all descriptions of coal and coke; and its constitution will be such as to secure, by means of Sectional Committees adapted as far as possible to each class of trade, discussion and uniform action suited to the varying trade conditions.

"From what has been said, it will be apparent that there is no intention to seek to raise prices to such an extent as to prejudice the maintenance and development both of the coal trade itself and of the industries dependent on it. The rise and fall of prices are, it is believed, largely beyond the control of any organization, even one as powerful as that now contemplated; but the careful watching of the changes may permit the members of the Association to minimize or guard against dangers which they cannot altogether prevent.

"An attitude of explanation and co-operation will be adopted towards gas companies, railway companies, iron masters, and any other large bodies of consumers. The consignment of coals on speculation, and the making of contracts of longer duration than twelve months, except on sliding-scales varying with the price of manufactured products, will be discouraged.

"The colliery owners of Durham and the adjacent parts of Northumberland are encouraged in their views by the belief that similar steps are in contemplation in other districts.

"Thus explained, the coal owners do not see why the proposed Association should be viewed in any but a favourable light, both by the men whom they employ, and by the consumers whom they supply."

BRADFORD CORPORATION GAS, ELECTRICITY, AND WATER SUPPLY.

The Half-Yearly Gas and Electricity Accounts—The Nidd Water-Works Contracts.

At the Meeting of the Bradford Town Council last Tuesday—the MAYOR (Mr. J. Whitley) presiding—the above matters were introduce to the notice of the members.

Alderman MOULSON, the Chairman of the Gas and Electric y Committee, in moving the adoption of the minutes of that body, submitted the financial statement for the half year ending Dec. 31 last. He said twelve months ago the ex-Chairman (Alderman Priestman) stated that there was no reason why during the then coming year the Gas Committee should not have a profit of £10,000; but circumstances had arisen which had prevented this. If it had not been for the coal strike, they would not have been very far from realizing that amount. Everything else had gone on fairly well. There had been some expense at the gas-works in constructing a large tank at Valley Road, and in making certain other alterations and improvements; and there were some works still to be carried out. The chemical department had been very successful. The total quantity of sulphate of ammonia produced was 870 tons, as against 892 tons in the corresponding half of 1892. The price realized had been £12 4s. 2d. per ton, against £9 5s. 9$\frac{1}{10}$d. The price yielded per ton of coal carbonized, exclusive of the profit on the liquor bought, had been 2s. 3$\frac{4}{10}$d., against 1s. 9$\frac{3}{10}$d. The

sales of ammoniacal liquor had amounted to a total of £10,110, as compared with £9293. The stock of liquor at the works on Dec. 31 was of the value of £1736, as against £1401; and the stock at the chemical works was worth £2789, against £2405. The total value of liquor sold in the six months and now in stock was £14,636, as compared with £13,100. The stock of ammoniacal liquor at the works at the beginning of the half year was valued at £1029, as against £512 at the corresponding period of the previous year; and the stock at the chemical works was £1266, in comparison with £2582. The expenditure during the six months in this department had been £3216, against £2917 in the second half of 1892; and the balance to the credit of the department on Dec. 31 was £9124, as against £7088. Coming to the gas accounts, he had a working statement which showed that the quantity of gas made was 773,551,000 cubic feet, as against 799,250,000 feet in the corresponding period of 1892. The decrease of 25,699,000 cubic feet was entirely owing to the coal strike. The coal and cannel carbonized represented 77,887 tons, as compared with 77,098 tons. Extra coal to the extent of 38,000 tons had to be purchased during the strike. The gas made per ton of coal was 9931 cubic feet against 10,366 feet in 1892. Less was made than in the corresponding period because the Durham coal that was obtained was very much inferior to the Yorkshire coal. The coke produced was 29,535 tons, as compared with 31,854 tons; tar, 4710 tons, as against 4746 tons; and ammoniacal liquor, 10,084 tons, against 10,241 tons. The public lamps consumed 75,815,000 cubic feet of gas, in comparison with 74,688,000 feet in 1892. Twenty-five additional ordinary lamps and 49 additional Bray's lamps were erected during the six months; making a total of 6579 ordinary lamps and 827 Bray lamps. He was told that, in proportion to its population, Bradford had a larger number of lamps than any other town in the country. Turning to the revenue account, he found that the sales of gas amounted to £70,198, against £73,034 for the half year of 1892—a difference of £2836. The explanation as to the decrease might seem strange; but it was that there had not been anything like the consumption of gas on account of fog and dark weather that there was in the corresponding period of 1892, while the larger sale of electricity had to some extent caused a falling-off in the sale of gas. Other items on the credit side were: Coke, £13,506 (£11,367 in 1892); tar, £4171 (£4133 in 1892); oxide, £847 (£679 in 1892); chemicals, £9123 (£7087 in 1892); sundries, £395 (£454 in 1892); and rents receivable, £426 (£439 in 1892). The total receipts were £99,447, against £98,031 in 1892. On the other side of the account, they had £63,305 for coal (£48,664 in 1892); £1433 for purification (£1663 in 1892); £752 for salaries of engineers (£762 in 1892); £10,040, wages for carbonizing (£10,640 in 1892); £3393 for repairs of works (£3272 in 1892); £2487 for repairs of retorts (£3028 in 1892); £2013 for repairs of mains and services (£1725 in 1892); £1704 for cartage and yard labour (£1856 in 1892); £1073 for meter inspection (£966 in 1892); £3546 for new lamps, lighting, and repairs (£3669 in 1892); £746 for salaries of clerks (£706 in 1892); £2592 for rates and taxes (£2376 in 1892); £1290 for gas, water, and sundries (£1079 in 1892); £524 for bad debts and abatements (£361 in 1892); £425 for bank interest and commission (£228 in 1892); £9176 for interest (£9232 in 1892); £4247 for sinking fund (£4198 in 1892); and £283 for income-tax (£564 in 1892). The total expenditure was £109,947, against £95,756 in 1892. There was a net loss on the half year's working of £10,499. This deficiency was quite as small as they expected, in fact, smaller, bearing in mind the price that had to be paid for coal. Turning to the electricity accounts, Alderman Moulson said that the electric works were in fairly good order. The buildings had been completed; and the contractors and the Engineer had been paid off. Two engines of 200 indicated horse power each were ordered last year; and these were now in position. One had been doing good service since about the middle of December; and the other would be finished in about a fortnight. During the half year the sales of electricity came to £5510 (£4548 in 1892); hire of meters represented £100 (£79 in 1892); and hire of terminal boxes, £28 (£21 in 1892). The payments included £1500 for miscellaneous expenses (£1204 in 1892); £1175 for salaries and wages (£793 in 1892); £785 for interest on loans (£719 in 1892); and £827 for sinking fund (£577 in 1892). The total was £4463, against £3562 in 1892. The total amount of the capital was £56,679. The number of lamps connected with the mains, or their equivalent in current, was 28,400. About 2500 yards of mains had been laid during the six months. There would have been a very good profit from the electricity works had it not been for the coal strike, which had made the coal cost about £600 extra.

Alderman F. PRIESTMAN expressed the opinion that it would be a very great advantage to the Committee and the Corporation to reduce the price of electricity to 2½d. or 3d., for motive power only during the day. He had reason to know that people who were using a considerable amount of current would not go on paying 5d. for it, which was a higher price than they were giving for other motive power.

The minutes were then adopted.

On the minutes of the Water Committee being submitted,

Alderman HOLDSWORTH, the Chairman, stated that they included a number of resolutions accepting offers of easements in connection with the new water-works, for small sums; a resolution accepting the offer of Messrs. Verity to sell to the Corporation certain closes of land, with the buildings thereon, at Haden Carr, Middlesmoor, containing 500 acres, subject to lords' rents and tithe-rent charge, for the sum of £6000; a resolution accepting the tender of Messrs. Cochrane, Grove, and Co., of Middlesbrough-on-Tees, for the supply of about 17,384 tons of cast-iron pipes and special castings, for the sum of £70,584; and a resolution accepting tenders for the erection of various buildings at the Gouthwaite reservoir, amounting in the aggregate to the sum of £1901. As to the proposed purchase of land from Messrs. Verity, Alderman Holdsworth said the Corporation only required about 19 acres of the land for immediate purposes; but afterwards, according to their Act of Parliament, they would be compelled to purchase 30 acres more at the bottom of the valley, in order to make a reservoir. If the Corporation had bought these pieces of land separately, they would have been compelled to pay at least £100 an acre for them; and as the owners did not seem inclined to move from their position, the Committee had thought it better to purchase the whole of the land and buildings referred to. This arrangement enabled them to save the cost of certain reversions and works, and was in all respects the best one possible. With regard to the tenders for cast-iron pipes and special castings, nearly the whole of the piping was to be hooped with wrought iron; and there was a large proportion of special castings. This increased the price of the material; and the pipes therefore cost something like an average of £4 per ton, which was very reasonable.

Mr. PRATT seconded the motion.

Alderman PRIESTMAN asked whether it was part of the arrangement that every one of the large pipes should be tested by pressure above that to which they were likely to be subjected. He made this inquiry in view of the lamentable state of things existing in the connection between the Heaton reservoir and the high-level service. These pipes appeared to be bursting almost every week.

Alderman HOLDSWORTH said that precautions had been taken as to the testing of the Nidd pipes which, he believed, had not been equalled in the history of water-works construction. The test would be equal to eight times the actual strain which would be put upon the pipes. Regarding the pipes which had recently burst, he expressed surprise that they should have done so, and attributed it to rapid changes of temperature.

The minutes were adopted.

THE LONDON COUNTY COUNCIL AND THE ELECTRIC LIGHTING LOAN FOR ST. PANCRAS.

At the Meeting of the London County Council last Tuesday—Mr. J. HUTTON in the chair—the subject of the loan of £30,000, for 42 years, applied for by the St. Pancras Vestry for electric lighting works, was again under discussion. At the meeting a fortnight previously, the Finance Committee proposed that the loan should be divided as follows: £2500 for five years, £4200 for eight years, and £23,000 for fifteen years. The matter was referred back for reconsideration; and the Committee now recommended that the term for the entire loan should be 25 years. The Committee justified their altered view by elaborate arguments as to the life of different portions of the works, the cost of periodical renewals, &c., and the fact that precedents for 25 years existed in Manchester, Bristol, Blackburn, Portsmouth, and Leicester.

The VICE-CHAIRMAN (Mr. C. Harrison) moved, as an amendment—"That the recommendation be referred back to the Committee, with an instruction that, as the loan will be expended, not for renewals, but for initial cost in establishing electric lighting works, which are income-producing and remunerative, it is advisable that the loan should be made for the full term sanctioned by the Money Act, 1892, for electric lighting purposes." He said the principle at stake was a most important one. London was just emerging from a state in which it had left all remunerative undertakings to be taken up by private commercial speculators. St. Pancras had seen the advantage of undertaking the profitable work of electric lighting; and the question was whether the parish was to be hampered in setting such an excellent example. The practical result of the limitation of the term of repayment to 25 years would be that it would be considerably cheaper to leave the work to a private company in the way the Corporation of the City had done. He could not see on what principle the term of 25 years had been fixed, unless as a mere compromise between persons holding different views. It might be suggested that 25 years was the possible average life of the works, and that the Local Government Board had set the example of this term. The limitation of the term to the "life of the works," however, had been confined to purely unremunerative works—main roads, new streets, &c. The considerations in such cases were entirely different from those bearing on the present matter. He referred to the establishment of gas-works in different parts of the country—these works being, he said, well known to be very short-lived. Municipalities were not treated in regard to gas-works in the way now proposed. They were not told: "You may borrow so much for land, so much for buildings, so much for gasholders, and so on, and shall repay each amount in a separate term." No; they were allowed one long-period loan for the whole outlay. At Manchester, £370,000 was raised for 57 years; and in another case the term was 83. Leeds had £1,250,000 for 60 years; and Bradford, £600,000 for 81 years. All the outlay was put on one period, and that a long one. It was considered that the return from the undertaking could not be kept up unless it was properly maintained and renewed, and that therefore the initial cost might be charged over a long term. In 1882 came the Electric Lighting Act, by which all the Vestries were bound to form a sinking fund, which should be at the discretion of the Vestry; but in no case less than 2 per cent. per annum. That sum accumulated at 3 per cent. would pay off the whole in 31 years. Commercial companies were at first limited to 21 years; but in 1888 this was raised to 42 years, at the end of which time the local authority had the power to purchase. The Act of 1888 distinctly showed that Parliament considered the life of an electric light undertaking to be at least 42 years. Owing to the difficulties which had arisen in connection with St. Pancras, Parliament had passed an Act enabling the Council to raise the term of repayment to 50 years; and he contended that St. Pancras was entitled to liberal terms which would encourage the undertaking. It had been said the Vestry were not bound to create a fund for depreciation; but he showed that, under their own Order, the Vestry were compelled to set apart sufficient sums for depreciation and reserve, and could not divert the revenues of the undertaking until these conditions were carried out. He contended that there was a broad distinction between remunerative and non-remunerative undertakings; and that, in regard to the former, a Vestry were, in the nature of things, bound to maintain the plant in working order so long as they desired to derive the profits.

Mr. M'CALL seconded the amendment.

Alderman ARNOLD said the remunerative character of the work was a reason for shortening rather than lengthening the term of the loan. As a member of a House of Commons Committee, he remembered that, when Bury applied for a loan for gas-works, the term fixed was 27 years. Did the Vice-Chairman mean to say that Parliament had sanctioned loans of this kind for 80 years? He ventured to assert that the practice of Parliament had been uniform, and that no single case could be shown where it had sanctioned a loan for public lighting

for 50 years. If the Council agreed to this proposal, he was certain that the Treasury would overrule them. Who would dare to affirm that in ten years' time the supply of electricity would be carried out on the same lines as at present?

Mr. WESTACOTT asked if the Vice-Chairman meant by his amendment 42 or 50 years.

The VICE-CHAIRMAN said the Council had now full authority; and the Treasury would not review their action. The term intended by his amendment was 42 years.

Mr. B. L. COHEN, M.P., considered it was most necessary, for the financial credit of the Council, to lay down rigid, automatic rules as to the terms of loans for all purposes, which would educate borrowing bodies as to the practice in the matter. There would be absolutely nothing remaining in five or ten or twelve years, of the plant for which St. Pancras now proposed to borrow. The question of remunerative or unremunerative work was irrelevant. The Council had power to grant the loan for the full period; but they would, if they did so, be violating the obligation laid upon them to consider "if any considerable portion of the work was for short-lived purposes."

Mr. W. W. BRUCE said the only rule of finance of the Vice-Chairman was to put off payments from the present day to some future time. The whole of the proposed new loan was for temporary works. The Council had come to a definite agreement with the Treasury that "short-period capital loans" should be for 25 years. They had acted up to this themselves; and why they should violate the rule in favour of St. Pancras, he could not see.

Mr. BUXTON remarked that, if this loan were granted, the Vestry would be compelled, after using up the first generation of machinery, to borrow again for a second supply, or to continue to use worn-out, obsolete, and uneconomical plant. In time the ratepayers would be paying the instalments of three separate loans for successive machines doing the same work.

Mr. C. H. CAMPBELL opposed the amendment "tooth and nail." Mr. Harrison's views about finance were, to his mind, most heretical.

Mr. M'KINNON WOOD said Mr. Cohen's remark about remunerative or unremunerative work raised a clear issue. The Treasury recognized the force of the Finance Committee's contention, "especially in regard to the certainty that in such cases no neglect of maintenance is possible." The point was that the plant must be maintained and renewed if the work was to go on, and that the renewals could be met out of revenue.

Mr. HOARE said that ordinary repairs might be paid for out of income; but large renewals would be from time to time required, which could not be met out of the current year's revenue. The Finance Committee thought that, by shortening the term of this loan, they would leave the Vestry at liberty to borrow later on for exceptional renewals.

Alderman SPICER said he had not agreed with the decision of his Committee to limit the loan strictly to the life of the works: but he regarded the present proposal as a compromise which ought to satisfy all parties, and make it quite possible for the works to pay. It was true that Parliament years ago granted very long periods for loans for lighting; but since 1882 things had been very different. If the Council allowed every loan for the longest possible period, they would put themselves in a serious position when they went to Parliament to obtain an extension of the term for housing loans.

On a division, the amendment was lost by 61 votes to 36.

Dr. COLLINS moved a further amendment that the term should be raised to 30 years. He pointed out that they were now making a precedent for all time.

Mr. BENN seconded the amendment.

The closure was moved; and Dr. Collins's amendment was lost by 49 votes to 44, after a debate extending to two hours and a quarter.

THE FORMATION OF SMALL GAS COMPANIES.

A "Promoter's" Confessions.

The London Bankruptcy Court was a few weeks ago the scene of some proceedings of unusual interest to shareholders in small gas undertakings; the occasion being the examination, before Mr. Registrar Brougham, of Mr. Frederic Pope, of 9, London Street, E.C., described as a "company promoter." According to the official summary, Mr. Pope had been engaged, during the past four years, "in purchasing various undertakings, mostly gas and water works, and selling them to limited companies formed by him. He appears to have promoted 15 of such companies during the past three years, and estimates his profits on these transactions at upwards of £3000 (gross)." Among these companies were the following: Billericay Gas Company, Bromley District Gas Company, Buckfastleigh Gas Company, Crowland and Eye Gas Company, Godstone Gas Company, Kempston Gas Company, Penryn Gas Company, St. Ives Gas Company, South-East Essex Gas and Water Company, and Upton-on-Severn Gas Company. The assets scheduled included £1250 estimated profit on a purchase of land at Earlswood. This sum, however, represented the difference between the purchase price of the land (no part of which has been paid) and the amount Mr. Pope supposed he could get for it from a company he was engaged in forming at the date of the receiving order. Included in the statement of affairs, there are "losses through betting" to the amount of £89 12s., and "contingent liabilities," which include £500 due on a mortgage of the Billericay Gas-Works, and £3000 and £2500, representing respectively unpaid balances of purchase-money of the works at St. Ives and Buckfastleigh, which balances, according to Mr. Pope, were to be paid by the Companies who had acquired these works from him. Among the assets, there appears "other property," estimated at £2324. This, according to the Official Receiver, consists of "a commission note, valued at £800, for commission on a contract for the erection of water-works in South-East Essex, which have not yet [Oct. 24, 1893] been commenced; balance (£350) of the sale price of gas-works sold by the debtor to a limited company; commission (£345) due from a tramway company for services rendered; shares in various companies, valued at £719, representing the amount paid and calls due thereon; freehold land, valued at £31, at Benfleet, Essex; and deposit paid (£9) on the purchase of two plots of freehold land at Southend-on-Sea. It appears from the proofs lodged, adds the Official Receiver, "that some of these properties are in the hands of creditors. . . . The realizable value of them must be regarded as extremely doubtful." The *Financial News* has lately shown considerable interest in the debtor's proceedings; devoting nearly seven columns to the matter. The foregoing figures appeared in the issue of our contemporary for the 10th inst.; and last Tuesday a verbatim report was given of Mr. Pope's public examination on the 19th ult. From this we have extracted the following particulars.

Mr. Pope stated that he was a "company promoter," and had been engaged in the business about four years. Before that he was not in business. About fourteen years ago, he was a steamship agent and owner; but this business came to an end in 1880. He then had about £3000. In 1884 and 1889 he was convicted of fraud, and had to suffer the penalty. This was in London. At the time he began promoting companies, he had £50 of capital; and his business was to buy properties, spend money to improve and develop them, and then sell them to companies. The Godstone and District Gas Company was a new enterprise with works to be erected. He formed the Company, and assisted in obtaining a Provisional Order granting them powers. For about four years, the offices were at his offices. He simply attended to the working of the business; and there was a current account between them. There was about £90 due from him to the Company. They paid him £20 a year rent, and left in February last year. There was a nominal Secretary; but the real secretarial work was done by himself. He received money and made payments for the Company; and the £90 was the balance against him. To the best of his ability, he had entered everything in the books he had produced. He had six £5 shares in the Company; but they had been deposited as collateral security for some bills under discount. The Company had brought an action against him to recover the balance of the claim, and had obtained judgment. The Bromley Gas and Water Company was started to supply Bromley with gas and water, which was formerly done by the Guildford Company. The Company bought the right of supply and the plant for £1600; and he paid a deposit of £100, but did not pay the balance. One of the conditions was that he should obtain the Provisional Order to sanction the transfer; but, owing to the opposition, he could not get it. Consequently, he lost his £100 and £300 besides. The Company was still in existence, with a capital of £600, of which he subscribed £300; and the rest was provided by his friends. He got back the £100 deposit; but he lost it, and also the £300 he had subscribed. He held 64 £5 shares; and he had put them among his assets. The South-East Essex Gas and Water Company was formed in 1890; and a Provisional Order was obtained for the construction of water-works and supplying the district round about Southend—principally Leigh. He arranged with certain contractors to erect the works at a cost of £20,000, on which he was to have 4 per cent. commission. They had not carried out all the work, because it was one of the conditions that they should not commence until £4000 had been subscribed; and this had not been done. He thought about £2300 or £3000 had been paid; and he had 45 £10 shares. The Company were waiting for better times, to get more money in. They undertook to buy from him some works at Leigh, which he had arranged to purchase from the owner for £950. He paid a deposit of £50 to him; but when the time came for completion, the Company had not any money, so he forfeited his deposit; and the works had since been sold to another Company. He did not get anything out of the formation of that Company, beyond the commission. He was to have £2000 for the preliminary expenses. He had about £1150 in cash, and £750 in bills which were overdue. He had not paid all the expenses, because the Company did not pay all the bills. He thought he still owed about £300. He considered he was not bound to carry out his part of the contract until the Company settled their bills. He had paid more than £300 of the amount; and this had cleared off all that was owing. With regard to the Kempston Gas Company, he simply registered that, and advanced the money for it; and he had the capital subscribed, for which he received a commission of £170. His only interest in the Company was ten £5 shares. The Company was unsuccessful. As to the Upton-on-Severn Gas Company, the works had been in existence for about thirty years; but they were very much out of repair. They belonged to a private individual; and he (Mr. Pope) gave £750 for them. He paid a deposit of £37 10s., and £50 for possession. The purchase was completed; and the Company formed erected new works. He sold the works for £1000, and made a profit of about £300. He had ten £5 shares in the Company; but early in October last year, he disposed of them to Mr. Bradley, his Solicitor, for £20 or £25. Mr. Bradley acted for him all through these proceedings. He (Mr. Pope) had received the money from Mr. Bradley; and he thought it was paid to the petitioning creditor's Solicitors. Coming to the Crowland and Eye Gas Company, that was formed in March, 1892, for the purpose of purchasing his interest in the lease of the works, which were thirty years old. He leased them for £70 a year rent from the Crowland and Eye Gas Company; and he undertook to put them in repair. After he had spent £200, he transferred his interest to the new Company. About eight months elapsed between the time he purchased the lease of the works and the new Company taking them over; and he carried on the business in the meantime. He thought he made about £70 profit. He was not indebted to the Company; he had had £150 for the bills they had given him. He had bills for £500, three of which he discounted for £155; and he was to receive the balance of £345. The bills for the £155 were still outstanding; and the petitioning creditor was in possession of one of them. He (Mr. Pope) considered the £345 would be ultimately a good debt; it wanted a little more work done for it. Next as to the Penryn Gas Company. In that case he bought the works, and sold them to a Company. They also had been in existence for some thirty years. He bought them as they stood for £4100, and contracted to sell them for £5100. The purchase was completed; and the Company were doing very well. It was formed a year ago last November. He had not now any shares in it. He bought some in August, and sold them in September to Mr. Bradley for £15. He had 25 fully-paid up shares; and he had a cheque for the money. This did not go to the petitioning creditor;

but he thought it went to defray his own personal expenses. The Billericay Gas Company was formed in October or November, 1892. He entered into a contract to buy for £1100 some works that had been in existence for about twenty years; and he agreed to sell them to the Company for £1400. The arrangement was completed; and he received a profit in cash. He had some bills given to him for the profit; and they were met at maturity, and £50 was overpaid. The Company had a claim against him for that £50; and they appeared as creditors for the amount. He had some shares in the Company at one time; but they were subsequently forfeited. The St. Ives gas undertaking was acquired by him in March last year, for £3500; and he sold it for £4500. He had had his £1000 in cash. In fact, he had had £1500 altogether; the other £500 being paid to his vendor. The Company still owed £3000. They were to pay £1000; and he obtained a mortgage for it for £2000. The balance was to be paid in cash. They had till March 24 to do it; and no doubt they would complete the transaction. In the meantime he was liable. The bills he had received had matured, with the exception of one or two, which would be paid. There were two running at the time of his bankruptcy; but he thought one of them had run off. The Company had paid it; and he had no doubt they would pay it all up. With regard to the Buckfastleigh Gas Company, he was under a great many liabilities with respect to that concern. The Company was formed in June, 1893, to purchase the works from him. The purchase-money was to be £3700. He had bought them for £3000. He did not pay any deposit in that case. Bills were given for £500; and there was still £2500 owing. These bills were proved for in his estate; they were held by the Capital and Counties Bank. He received bills for £700; and the Company accepted his draft for £500 in part payment of the purchase-money. He was liable on the bills for £1200. The purchase was not completed; and he was afraid it would not be. He thought the Company would soon be wound up.* He feared all these bills would rank against his estate. He hoped that they would all have gone off, as they might easily have done, if the Company had pulled through. Mr. Pope was then questioned with regard to the land at Earlswood; and the examination was brought to a close.

EXTENSIVE IMPROVEMENTS AT THE MIDDLESBROUGH GAS-WORKS.

At the Meeting of the Middlesbrough Town Council last Tuesday, Alderman Hugh Bell, in moving the adoption of the minutes of the Gas Committee, referred to their proposal to extend the gas-works. At present, he said, the gasholder accommodation of the town was about 1,125,000 cubic feet; and as the maximum consumption amounted to 2,000,000 cubic feet in twenty-four hours, they were considerably under the necessary holder accommodation, which should be equal to not less than a twenty-four hours' supply. It would be impossible between now and next winter to do more than make temporary provision; and they could only hope that they would be able to get through this period without any serious inconvenience. In order, then, to encounter next winter without being put to severe straits, it was proposed that No. 3 holder, which was at present out of use, should undergo temporary repair, at a cost of about £200. This would contain 246,000 cubic feet; so that by the winter they would have nearly 1,500,000 cubic feet accommodation. The Council were also asked to sanction the building of a holder on the Marshes, of a capacity of 1,500,000 cubic feet. This, together with the accommodation they now had, would give them a storeage of 2,750,000 cubic feet, and would serve the requirements of the town for some time to come; but it would take the contractors all their time from the earliest day at which the tender could be let till the winter of 1895-6 to get the holder ready for use. So soon as next winter was over, it was proposed to proceed with the erection of additional retorts on the existing site, where there was ample space; and this would augment the production (which at present stood at a little above 2,000,000 cubic feet per 24 hours) to 2,750,000 feet. In the summer of the following year, it would probably be necessary to undertake greater extensions to meet the growth of the town, which, if it went on at the present rate, would in 1899 necessitate provision being made for about 3,000,000 cubic feet of gas per day. The work to be undertaken immediately would cost not less than £25,000, and possibly a larger sum than that. No further expense would be undertaken until the Committee met again, when it would be for them to consider the question of the erection of a further series of retorts, which would cost something like £6000 or £8000. In reply to a question, Alderman Bell stated that the powers obtained by their last Act of Parliament would cover the proposed new works. Alderman Taylor seconded the motion, which was carried.

THE MANAGEMENT OF THE STOKE GAS-WORKS.

At the Meeting of the Stoke Town Council last Thursday, under the presidency of the Mayor (Alderman H. C. Faram), a very important debate, which was at times marked by considerable excitement, took place on the subject of the management of the gas-works. Readers of the JOURNAL are perfectly well aware, from the reports which have appeared therein, that for some time past there has been dissatisfaction at the way in which the works have been carried on; and the discontent culminated on the above-named occasion in a vote adverse to the Manager (Mr. Herman Taplay). We shall not attempt to award either blame or praise, but simply record briefly what took place. The Special Gas Committee sent in two resolutions they had passed in reference to the gas-works; but they were received too late to be placed upon the *agenda* for the meeting. The Mayor asked if the Council should deal with them under the Executive Gas Committee's report or at a special meeting. The Town Clerk said the proper course would be to move the suspension of the Standing Orders. After a short discussion, the Executive Gas Committee's minutes were adopted, and the Standing Orders formally suspended. The Town Clerk then read the resolutions passed by the Special Gas Committee, which were to the effect that (1) the foreman continue in charge of the manufacturing department; and (2) that, the Committee having lost confidence in Mr. Taplay, he be called upon to resign his position as Manager of the gas-works. The Committee were prepared to accept his resignation at once, three months' notice to be given, and the Committee empowered to give him three months' salary in lieu of notice. On the motion of Mr. Geen, the first resolution was agreed to, with the addition of the words "until the next meeting of the Council." The Mayor then opened the discussion on a motion for adopting the second resolution; going in great detail into the whole question of the management of the works. Mr. Greatbatch followed with a long speech in defence of the Manager; and he concluded by moving an amendment to the effect that the matter be referred back to the Gas Committee, in order that a qualified gas engineer might be engaged to investigate the subject, and report to the Council. This was seconded by Mr. Beardmore. Mr. Geen then entered upon a long defence of the Gas Committee. Alderman Kirkham expressed the hope that the Council would accept the amendment, and, in fairness, hesitate to remove Mr. Taplay from his position. He maintained that, if the Committee did not bring in independent evidence, it was because they dare not do it. After some further remarks, the amendment was put and lost by 13 votes to 9. Another amendment was brought forward, to the effect that the matter be referred to a Select Committee of the Council, consisting of the Mayor and six members named. It was, however, lost by the same number of votes as its predecessor; and the original motion was carried. Mr. Greatbatch took exception to the legality of the proceedings, on the ground that four days' clear notice had not been given to Mr. Taplay of the intentions of the Committee, as required by the Standing Orders. The Town Clerk said he should require time to decide whether or not the proceedings of the Committee came under the rule referred to. The meeting then closed.

* An order was made by Mr. Justice Wright on the 7th inst. for the winding up of this Company (see *ante*, p. 285).

DEWSBURY AND HECKMONDWIKE WATER BOARD.

Proposed New Reservoirs.

For upwards of half a century, Dewsbury has enjoyed the advantages of a plentiful and wholesome water supply. The smaller local authorities in the district have not been slow to recognize this fact; and those not having independent supplies are now purchasers from the Dewsbury and Heckmondwike Water Board—a body comprised of six representatives of the Dewsbury Corporation, and two from the Local Board of Heckmondwike. In the year 1853 these bodies jointly carried out the scheme which up to now has answered so well, and connected with which there was an initial expense of £375,000. But the area of supply has gradually widened; and the fear of a possible prolonged drought has induced the Water Board to take such steps as shall find them prepared to meet any emergency of that kind. On the recommendation of Mr. G. H. Hill, they are about to construct two new reservoirs on the Harden Clough Dyke, at a total estimated cost, including land, of £50,000. In a report which Mr. Hill has submitted to the Board, it is stated that the population of the district of supply, including Ossett, is about 65,000. Calculating 30 gallons per head per day, the total supply required is, roughly, 2,000,000 gallons per day. Allowing for increase in population, the quantity which will be needed in ten years will not be less than 2,500,000 gallons per day. The gathering-ground and works will, when the Upper Windleden reservoir is completed, give rather more than 2,000,000 gallons per day in dry seasons. This quantity cannot, therefore, be safely taken as more than sufficient for the immediate future; and any works to meet prospective requirements should (says Mr. Hill) be taken in hand, so as to be available in four or five years. The joint capacity of the two proposed new reservoirs will be 137,000,000 gallons; and the water available from them for the town in dry seasons, after paying the water compensation, will be about 650,000 gallons per day. About a dozen tenders have been received for carrying out the work; but the Board have not yet made their selection. It is expected that it will be nearing the end of 1896 before the work is completed. It may be mentioned that during the drought of last summer the water supply in the district was not curtailed, though the users were cautioned against wasting it.

The Electric Lighting Question in Londonderry.—The Corporation of Londonderry discussed for nearly three hours, on the 9th inst., the position of the electric lighting scheme, to which several references have already been made in the JOURNAL. There was an unusually large attendance of the ratepayers, who during the debate, which at times became very exciting, testified by vigorous applause their approval of the condemnation to which the scheme was subjected. A proposal was brought forward to apply to the Local Government Board for a loan of £5000 in addition to the £15,000 already sanctioned, to complete the 170 arc lamps which have been commenced. To this an amendment was moved to the effect that, in consequence of the absence of reliable information as to the cost of the scheme, no further loan should be asked for. In the end, the amendment was lost. An attempt was then made to cut down the amount to £3500. But, although it was pointed out that the borrowing of £5000 would entail an additional outlay of £508 a year for rates, it failed; and the original motion was carried by a majority of three. The citizens of Londonderry, therefore, speaking through their representatives, have pronounced in favour of a system of lighting which it is said will cost them, at a moderate computation, twice as much as gas. Of course, they may be supposed to know their own business best; but the present time, when taxation is sufficiently heavy, seems inopportune for indulging in a luxury which it is estimated will impose an additional burden of 6d. in the pound for some years to come.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

This week has seen an end of the opposition to the Dundee Corporation's proposals with reference to the reconstruction of the Gas Commission. The Nine Trades met on Tuesday, and the Chamber of Commerce and the Guildry on Thursday; and at all three bodies, resolutions were unanimously adopted instructing their members to support the Corporation Bill, and not to oppose it. One or two members—particularly of the Nine Trades—gave vent to grumbles at being shut out of the Commission; but all the bodies felt they were in a hopeless position as regarded fighting the Town Council. The understanding is that members of the outside bodies will seek to enter the Town Council; and thereby they will represent any outside interest which may consider they have interests to protect in connection with the Gas Commission. The sentiment that where there is taxation there should be representation is too strong to overcome the plea that, as those outside bodies assisted in the formation of the Gas Commission by opposing the Bills of the Gas Companies at the period of the transfer, they should be allowed to remain on the Gas Commission for all time. One of the speakers at the meeting of the Nine Trades put the matter sensibly, when he said that the Town Council had shown their gratitude for the services rendered at the time of the transfer, by giving them 25 years' representation. The new arrangement, whereby the Town Council will alone be the Gas Commission, is intended to save the time of public men, by reducing the number of meetings which they will require to attend; and it is also intended to lead to economy, by enabling the Council to reduce the number of paid officials. Two statements which were made in the course of the discussions are certainly worthy of notice. One was that 7500 ratepayers, or one-fourth of the whole, do not use gas. The other was that the capital of the gas undertaking in Dundee stood next highest to that of Dublin, in the matter of not being represented by structural value. Both these facts show that there is much work in front of the Gas Commission when it enters upon its duties in a reconstructed form; and I think they both justify the action of the Council in seeking to have the business entirely in their own hands.

The subject of the valuation of the gas-works was under the notice of the Perth Gas Commission this week. The works stand in the books of the Commission as an asset representing £45,000. The Works Committee are not satisfied with the entry; and they have sent to a Sub-Committee to consider as to re-valuing the works and the capital value of the annuities. Another subject which came before the Commission is one upon which other bodies will require to take action. It arose under the Fertilizers Act of last year, which requires the vendors of all manure and feeding-stuffs to place on the invoice the analyses of the materials they sell. The Commission sell sulphate of ammonia; and they have therefore considered it necessary to employ Mr. Tatlock, the City Analyst of Glasgow, to analyze the sulphate of ammonia they produce, in order that they may comply with the Act. There is a difficulty in the matter certainly, in respect that variations in the quality of the stuff may occur; and the Commission might quite innocently be prosecuted for not supplying sulphate conforming to the warranty they gave. It will be necessary to watch the production carefully; and in the event of a change of coal, or other circumstances affecting the result, to have a fresh analysis. In that view, it might be advisable to educate one of the officials in the works so as to enable him to keep the Commission right in all such matters. The Act, I presume, only applies to substances sold as fertilizers—that is to say, sold to a person who intends to apply it to fertilizing purposes; and it would therefore not refer to a producer selling to a person intending to sell over again. It would lie with the seller to the agriculturist to procure the analysis, and not with the producers. I do not know that this is so; but it occurs to me as a probable reading of the Act, and it is a point worth looking into. If it should prove to be correct, the Act will strike a blow at the small producer, by making it more costly for him to place his goods upon the market, or by requiring him to sell wholesale, at, of course, a lower price than he would get if he sold direct to the agriculturist. In that way, the direct trade, which all have tried so much to foster, would be almost stopped in the case of small works. The Perth Commission find it next to impossible to get rid of their spent lime. They get 1s. a load for it; but it costs them 10d. to cart it. They have therefore resolved to advertise that the lime can be had at the works for nothing.

The Town Council of Rothesay propose to erect sulphate of ammonia plant at the gas-works; and they have appointed a deputation to visit the Coatbridge Gas-Works, to see the plant in operation there.

A Special Committee of the Paisley Town Council have reported that, in their opinion, it is undesirable in the meantime to take advantage of the Local Authorities' Loans Act, because, among other reasons, the Gas Corporation should be able to renew their loans at 3 per cent. The recommendations of the Committee deal with a number of other matters of town finance; and a meeting of the Council is to be held to consider them. The scheme was submitted by Mr. Mathieson, who said that, if they found they could not get the money on mortgage for five or seven years at 3 per cent., they could then adopt the Act. For the redemption of burgh annuities, and the purposes of the Gas Improvement, Water, and Road Trusts, a sum of £200,000 would be required. Taking the Gas Trust as an illustration of how it would work, Mr. Mathieson said that for the year ending in May last they paid £2766 as interest upon mortgages, and £500 to the sinking fund—making together £3266. They had arranged for the current year to place £1000 to the sinking fund; and by paying away the sinking fund, in May next, their debt would be reduced to £64,700. If they had the money at 3 per cent., a sum of £1920 would pay the interest on the debt; and an annual sum of £575, with compound interest calculated at 3 per cent., would pay off the debt in 50 years. That would be an annual charge of £2495, or £271 less than was paid last year for interest alone. The scheme is a high-flying one. It is also a meritorious one; but I fear the Committee have not provided for extensions of the gas-works, and so the Corporation might find, at the end of 50 years, that there was still a debt to be liquidated.

A Glasgow newspaper to-day announces that it is in contemplation to reduce the charge shortly for electric lighting in Glasgow, from 7d. to 6½d. or 6d. per unit. The newspaper is one in which frequently very unreliable intimations regarding lighting matters are made; but in this instance there is probability in the statement, as otherwise the Corporation might be accused by some of selling electric current at the highest, while they sell gas at the lowest figure in Scotland.

The Falkirk and Larbert Water Trust have been most unfortunate with their reservoirs, of which they have three, situated respectively on the Earl's Burn, Faughlin Burn, and Little Denny Burn, all tributaries of the River Carron. The completion of the works was rather hurried by the Water Trustees in the spring of 1890; and, probably as the result, the reservoir at Earl's Burn has never given satisfaction. Recently the Trust agreed upon a scheme for the strengthening of the embankment of the reservoir, at considerable cost. Now the embankment of the Little Denny reservoir, which is the one nearest to the town, and is used as the main storeage reservoir, has given greater cause for uneasiness than that at Earl's Burn. During the great storm of wind and rain which prevailed all day last Sunday and through the night to Monday morning, a serious slip took place at one end of the embankment, which, according to the opinions of the Trustees, might, if it had not been observed, have resulted in a horrifying calamity. For the prevention of the disaster, the community are indebted to the vigilance of Mr. Neilson, the Superintendent of the works. That gentleman, along with Provost Griffiths, visited the reservoirs on Sunday afternoon; and finding the water passing over the waste weirs in large volume, he ordered all the scour-valves to be opened. After returning to town, he perceived an increase in the violence of the storm; and at nine o'clock at night, he again journeyed to Little Denny. Gruesome work it must have been, wandering about the embankment all night watching it, when he and his assistant were obliged to hold on by each other to prevent themselves being blown over the bank by the great force of the wind. They were unable to maintain their position at one time. At five o'clock next morning, Mr. Neilson found water to be escaping at the north end five or six feet from the top of the bank. A slip had taken place which had weakened the embankment; and it was, of course, only a question of time when a gap would be made. Mr. Neilson and two men at once set to work to lower the sill of the waste-water weir, so as to let down the level of the water, and reduce the pressure upon the embankment. During the day the place where the fault occurred was strengthened as much as possible; and in the afternoon Mr. J. M. Gale, of Glasgow, arrived, and ordered the level of the reservoir to be lowered by 5 feet. Mr. Gale has been asked to report as to what should be done. It appears that there had been a defect in the puddle wall, which allowed the earthwork to become saturated with water; and that outside the embankment there was also a springing of water which had assisted in loosening the soil.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *Feb.* 17.

Sulphate of Ammonia.—There is no change in the position; but prices are just a shade harder. It is a surprise that, in spite of the small Continental demand, the figures are so well sustained; and this fact may be accounted for by the absence of any pressure to sell. There is in reality an unusually small quantity offered for sale, the causes of which have been previously explained. Shipments to Spain and America are being resumed; and it is not unlikely, in the event of an improved demand all round—the probability of which is scarcely doubtful—that prices will harden before long. Nitrate is steady at 9s. 6d. per cwt.

LONDON, *Feb.* 17.

Tar Products.—Pitch shipments are very active; but new business is practically *nil*. Buyers are expecting lower prices, and will not pay what distillers are asking for the rest of the season. Fortunately there are no stocks either in makers' or consumers' hands. The falling value of coal, however, may compel fuel makers to restrict the consumption of pitch, unless the value is reduced. Fifty per cent. benzol is now as difficult to sell as 90's. This is a great disappointment to distillers, who had hoped that the necessity of toluol for colour making would have kept up the value of 50's as well as toluol, whatever might happen to 90's. Solvent naphtha is weak; but at the price quoted below, there are large buyers. Creosote and other tar oils are also weak; and, in most instances, prices are being shaded. One or two tar contracts have been let at prices ranging from 15s. to 17s. 6d.; the difference arising from the quality of the tar and the proximity to distillers' works. Other products have changed hands at the following rates: Tar, 15s. to 17s. Pitch, 28s. Benzols, 90's, 1s. 2½d.; 50's, 1s. 4d. Creosote, 1¼d. Creosote salts, 25s. Solvent naphtha, 1s. 2d. Toluol, 1s. 7d. Crude benzol naphtha, 30 per cent., 7½d. Carbolic acid, 60's, 1s. 9d. Cresol, 1s. 2d. Anthracene, 30 per cent., "A," 1s. 1d.; "B," 10d.

Sulphate of Ammonia is not so brisk. This is largely because there are not only no stocks in makers' hands, but makers are quite indifferent to present market prices; many of them having sold their productions for the season. Business, however, has been marked by a distinct advance. While £13 15s. was the value at the commencement of the week, £13 16s. 3d. to £13 18s. 9d. can be obtained to-day, less the usual 3½ per cent. discount. Gas liquor is quoted 8s. 6d. to 9s. 6d. per ton.

Reduction in the Price of Gas at Drighlington.—The Directors of the Drighlington and Gildersome Gas Company have sent a notification to the Drighlington Local Board of their intention to reduce the price of gas to 2s. 8d. per 1000 cubic feet from April 1 next. The Board, however, are dissatisfied with this, and have asked the Company to lower the price to the original figure.

Leeds Gas Workers and an Eight-Hour Day.—A memorial was presented to the Leeds Corporation Gas Committee last Thursday on behalf of the foremen stokers, engine-men, and other workmen employed at the various stations asking for an eight-hour day—a "privilege" which is now enjoyed by the ordinary stokers. The question is to be considered at a future meeting.

COAL TRADE REPORTS.

From Our Own Correspondents.

Lancashire Coal Trade.—The continued very unsatisfactory condition of the round coal trade, which, although list rates are nominally maintained by the coalowners in this district connected with the Lancashire Coal Sales Association, is giving a decidedly weaker tone to the market, and increasing keen competition from outside districts, is necessarily causing buyers who have anything like large quantities to place to hold back. So far, there are very few inquiries coming upon the market for contracts; and as regards gas coal, the general impression seems to be that the best policy is to let these stand in abeyance as long as possible, as buyers would certainly seem to have more to gain by waiting than by coming upon the market just now. The demand for the better qualities, suitable for house-fire purposes, has fallen off to very small dimensions; and not a few of the collieries are scarcely working much more than half time, whilst stocks accumulate. In special cases, for very small quantities, 15s. is still being got for best Wigan Arley; but 14s. now represents more nearly the average price ruling in the market, with Pemberton four-feet and seconds Arley not fetching more than about 12s. 6d. up to 13s., and commoner sorts of house-coal 10s. 6d. up to 11s. per ton at the pit mouth. With regard to the lower descriptions of round coal, for steam and forge purposes, the inland demand is fairly good, with prices steady at about 10s. per ton at the pit mouth, for good ordinary descriptions. But in the shipping trade, there has been only a very limited business coming forward, and the competition from other districts is so keen that much lower prices are ruling at the ports on the Mersey; 11s. to 11s. 6d. being readily taken for steam coal, delivered at the Garston Docks or the High Level, Liverpool. Engine classes of fuel still meet with a fairly ready sale; and better sorts are by no means plentiful in the market. Prices are maintained at about 8s. to 8s. 6d. for the best qualities of burgy; 6s. 3d. to 6s. 9d. for the better qualities of slack; with common sorts at about 4s. 9d. to 5s. 3d. per ton at the pit mouth.

Northern Coal Trade.—In February prices of coals usually fall in this district; and this year is no exception to the rule. There is a diminished export; and as the demand for gas manufacture and domestic purposes is now very naturally decreasing, there is a considerable reduction in the demand for coals. The Northumbrian coal trade depends most on the export demand; and thus it has felt the blow most keenly. Prices have fallen for best Northumbrian steam coals to 10s. 6d. per ton f.o.b.; and it is said that one or two collieries have taken less to keep pits at work. Second-class coals are about 1s. per ton below best. Small steam coals are quiet; and the price now is about 3s. 6d. per ton. Gas coals have as yet felt little effect from the "Sales Association," as the combination is to be termed. Generally, from 7s. 3d. to 7s. 9d. per ton f.o.b. is the current quotation; but one or two collieries (and these are not in the combination) ask as high as 8s. 6d. It is believed that the "ring" of gas-coal owners will be formed. But doubts as to its endurance increase; and some collieries have refused to join it. The opposition of the great London Gas Companies to the scheme is a factor of great importance. Coke is rather quiet, at 14s. 6d. to 15s. per ton for best Durham qualities. Gas coke is unaltered; but the output is decreased, and stocks are rather less.

Scotch Coal Trade.—There is not much activity in any branch of the coal trade in Scotland, except that of small coal for boiler firing. This is accounted for by most works running full time, and by the difficulty, owing to the continued stormy weather, in getting away other descriptions, which leads to lessened outputs at the pits. Shipping is, in addition to the bad weather, slack on account of Continental buyers still holding back in the expectation of getting better terms. The only promising outlet abroad seems to be the Baltic ports, which have remained open this winter. Otherwise there is not much prospect of a large foreign demand. Trade will be consequently thrown back upon home demands; and it is fortunate that these are likely to be greater than last year. It is questionable, however, if they will be sufficient to prevent a fall in prices should the foreign demand not arise. There is therefore difficulty in saying how the masters and men will work out the questions which are between them. This week the men met in Glasgow, and resolved to stick to their demand for an additional 6d. per day before negotiating with the masters as to the formation of a Conciliation Board, which, of course, in the present state of matters, the masters will not agree to. Prices all round are lower, the quotations being: Main, 8s.; ell, 8s. 9d. to 9s.; splint, 9s. to 9s. 3d.; steam, 9s. 3d. to 9s. 9d. per ton f.o.b. Glasgow. For the week, the shipments amounted to 124,017 tons—an increase over the preceding week of 982 tons, and as compared with the corresponding week of last year of 31,192 tons. For the year to date, the shipments have been 768,119 tons, an increase on the shipments in the corresponding period of last year of 209,959 tons.

The Driffield Local Board and the Gas Company.—At the meeting of the Driffield Local Board on Monday last week, a Committee who were appointed to meet the Directors of the Gas Company with respect to the Bill they are promoting in Parliament recommended that the Board take all necessary steps to oppose it. A letter was read from the Chairman of the Company, saying that the Directors were wishful to meet the views of the Board, and had made an offer to the Committee (which was declined) to consider any objection made by the Board to any clause in the Bill, to consider any clause the Board might suggest, or to sell the works to them. In the discussion on the subject, Alderman White said he did not oppose any particular clause, but the whole Bill, as he considered the concern ought to be in the hands of the Local Authority. If the Company obtained the powers they asked for, they would have a monopoly. He moreover objected to the present position of the works in the heart of the town. The price of gas was to be fixed at a maximum of 4s. per 1000 cubic feet; the price now charged being 2s. 11d. No provision, however, was made for the lighting of the streets; and if the Company liked to charge £3 per lamp instead of £2, as at present, the Board would not be in a position to fight against it. The meeting was adjourned until March 2, in order that the requisite notices might be given.

The Gas Lighting Arrangements at the Irish Exhibition.—In the Court of Appeal last Friday, before the Master of the Rolls and Lords Justices Lopes and Davey, an appeal was heard from a judgment given by Mr. Justice Kennedy in the case of *Sugg and Co., Limited, v. Lord Arthur Hill and Others*. The action was brought to recover £635, the balance of an account amounting to £1200 for goods supplied for the purpose of the Irish Exhibition of 1888. The defence was that the plaintiffs had agreed to look for payment to a Company which had been formed for the purposes of carrying on the Exhibition, instead of to the defendants. At the trial, the Judge held that the defendants were liable. (See JOURNAL, Vol. LXII., p. 1043.) The defendants appealed. The Court dismissed the appeal with costs, on the ground that the defendants had failed to prove a contract of reservation between the plaintiffs and the Company.

The Newport (Mon.) Gas-Works Benefit Society.—The annual dinner of this Society took place on the 8th inst., under the presidency of Mr. T. Canning, Assoc.M.Inst.C.E., Engineer of the Newport Gas Company. The toast of "Success to the Society" was proposed by Mr. E. Southwood Jones, who referred in appropriate terms to the soundness of the principles on which it was founded, and to the excellence of its management. The Secretary (Mr. J. Whitefield), in responding to the toast, said the Society would soon be celebrating its Jubilee. The Chairman, also responding, said the Society increased in numbers, and had gone on flourishing. It was most advisable—and he always endeavoured to carry it out—to create a good feeling between employers and employed. The best way to settle differences between them was to bring them together as much as possible. As far as their own works were concerned, it answered admirably. Other toasts followed; the proceedings being enlivened by songs.

Cutting off a Supply of Water.—At the Lambeth Police Court last Friday, the Southwark and Vauxhall Water Company were summoned for having, in November last, omitted to give notice to the Lambeth Vestry that they had cut off the water supply to an inhabited dwelling-house, No. 76, Solon Road, Brixton. Mr. H. J. Smith, Clerk to the Vestry, said the proceedings were taken under the Public Health Act, which provided that where a water company cut off the water supply of any inhabited dwelling-house, they should in every case, within 24 hours after exercising their right in this respect, give notice to the Sanitary Authority. The attention of the Vestry was called to the house in Solon Road, which was without a supply of water; and it was found that the Company had failed to give to the Vestry the notice required by the Act. On behalf of the defendants, Mr. Helpman said the Company did not deny that the pipe was cut off on the 29th of November; but what they said was that, when they cut off the pipe, they did not cut off the supply of water within the meaning of the Act. On the 26th of September, two months previously, they had effectually cut off the supply to the house by turning off the stopcock of the communication-pipe; and when the pipe was removed on the 29th of November they merely removed a pipe which was not supplying water from the main into the house. On the 26th of September, when the water was turned off, owing to the non-payment of rates, a notice was sent to the Vestry. After waiting for two months, to see whether the rates would be paid, the Company on the 29th of November took up the pipe. Mr. Biron said it was perfectly clear that what was done on the 26th of September did not amount to a cutting off of the supply within the meaning of the Act, and that the actual cutting off did not occur until the 29th of November. He ordered the Company to pay a fine of 20s., and £2 4s. costs.

The Electric Lighting Question at Harrogate.—This question came before the Harrogate Town Council at their meeting on Monday last week. Among the minutes presented by the General Purposes Committee was a report from the Electric Lighting Sub-Committee to the effect that they had received tenders for the supply of electric lighting cables (to the amount of £1068), and that they recommended that of the British Wire Company to the Council for acceptance, subject to the consent of the Local Government Board, and on the understanding that the Council should carry out the work. Mr. Chippindale proposed, and Mr. Horner seconded, the confirmation of the minutes. The Town Clerk (Mr. W. H. Wyles) then read a letter received by the Mayor (Alderman Fortune, J.P.) on the subject of the recent town's meeting on the electric lighting question (see *ante*, p. 299), informing the Council that the resolution disagreeing with the Corporation undertaking the lighting at the town's expense was carried by a majority of two to one, and asking them to reconsider the question with the view of transmitting their rights to an independent and private company. Mr. Ward moved that the prayer of the requisitionists be considered at that meeting. Mr. Simpson seconded the motion. Mr. Chippindale remarked that the proper course would be to move that the particular minute be rescinded. The Town Clerk said it could not be moved then. They could only move to rescind the original resolution. Mr. Meyer then proposed that steps be taken to rescind the resolution passed by the Council on the 21st of August last, to themselves carry out the Electric Lighting Order. He questioned whether there would be any profit, but rather a loss, if the Corporation supplied the light. As other watering-places were handing over this work to companies, and only three had tendered for Harrogate, he thought, seeing that the Corporation had so many schemes in view, they might well entrust the electric lighting to a company. Alderman Milner considered the least they could do was to bow to the opinion expressed at the town's meeting, and go into the question again. Mr. Chippindale said he was not averse to the matter being reconsidered; but to his mind it would be a waste of time. After a long discussion, the Mayor remarked that, when the Corporation first took up the electric light, he went with them to an extent, and fought with them for its success. They had, however, gone farther, and committed themselves to an experimental scheme of using town's refuse for generating the steam. This would not answer. Their duty was to represent the public as fairly and truly as they could; and the voting in Harrogate was three to one against the electric light. Mr. Meyer claimed a right to reply; but there were continuous cries of "Vote." On his amendment being put, 8 voted for, and 13 against it. It was consequently lost; and the minutes were then confirmed.

The Water Supply of Calcutta and Madras.—According to the annual report on Sanitary Measures in India for 1891-2, recently laid before Parliament, the extension of the Calcutta water supply during the year under consideration was vigorously carried on. There were 581 stand-pipes for filtered water erected, and 36 miles of pipes laid; also 3 miles of pipes laid and 85 hydrants provided for unfiltered water. At the close of the year, the daily supply reached 19 million gallons of filtered water, and 4¼ million gallons of unfiltered water; giving a daily average per head of population of 35·93 gallons of filtered water in the city, and of 15·11 gallons in the suburbs, besides an additional supply of 10 gallons per head of unfiltered water in the town for bathing purposes. Premises connected with the filtered supply numbered 1439; bringing up the total to 21,280. The figures for the unfiltered connections wese 81 and 560. The quantity of water sent into Madras was 2049 million gallons, compared with 2091 millions the preceding year.

Gas Exhibition at Derby.—An exhibition of gas cooking apparatus, promoted by the Directors of the Derby Gas Company, was opened in the Temperance Hall, Derby, last Tuesday, by H. Swingler, Esq., J.P., Chairman of the Company, and Deputy-Lieutenant for the County of Derby. Mr. Swingler stated briefly that the object of the exhibition was to promote the use of gas for cooking and heating, and alluded to the large number of stoves in use in Leicester, Nottingham, Sheffield, and other neighbouring towns. Mr. Hanbury Thomas, General Manager of the Sheffield Gas Company, referred to the success which had attended the various exhibitions held in Sheffield, and strongly recommended the public of Derby to take advantage of the opportunities the Company were offering. Mr. E. W. T. Richmond, in proposing a vote of thanks to the Chairman, remarked on the energy with which the Gas Company were laying themselves out to cater for the wants of stove users. The chief exhibitors are the Davis Gas-Stove Company, Limited; Messrs. Richmond and Co., Limited; Messrs. D. Hulett and Co., Limited; the Incandescent Gas-Light Company, Limited; Messrs. Stott and Co.; and Messrs. Webb and Son. Cookery lectures, given by Miss Owen, have been well attended. Altogether, the exhibition has been very successful.

New Water-Works for Wellington.—The need of a proper water supply in the south-eastern and higher parts of Wellington has of late been very acutely felt; but the Town Commissioners have now in hand a scheme which will remove all anxiety in this respect for many years to come. The new source of supply is on Lord Forester's estate. A reservoir, which is in course of construction there, is so far completed that it can already be partially used. When finished, it will cover about 3 acres of land. The depth of the lower end will be about 25 feet; in the centre, 10 feet; and at the side embankment and at the upper end, 12 to 13 feet. The inlet, which conducts the water from two springs in the Black Hayes and Birch Coppice respectively and from the surrounding gathering-grounds, will act automatically; so that, when the reservoir is at high-water mark, the water will escape near the bye-wash to be formed in the catch basin. The sluice and straining apparatus chamber is constructed of concrete, with stone buttresses. Sluice-valves are placed 5 feet apart, so that the water may be drawn from the top at various levels. At the bottom of the tower is the supply-main, 7 inches in diameter. This is extended through the embankment and a short distance beyond; and to it a sluice is attached. Should a supply of water be needed for Ketley and Oakengates, the 7-inch pipe will be continued forward to the junction branching off to the old Lime Kiln reservoir on one side and to Ketley on the other, so that an additional 100 feet pressure may be given to the supply of either or both districts. For the purpose of increasing the supply to Wellington, and affording greater pressure at once, a 6-inch earthenware pipe has been laid from the new reservoir to the Lime Kiln reservoir. As already indicated, the reservoir, in its present state, is to meet a temporary purpose. Its completion awaits the sanction of the Local Government Board to a loan; and the ultimate dimensions and filtering arrangements will be dependent upon whether the supply of water is extended to Ketley and Oakengates.

The Rating of Mines for Lighting.—In the Queen's Bench Division of the High Court of Justice last Friday, before Justices Mathew and Collins, the case of *Thursby and Another v. Churchwardens of Briercliffe-cum-Entwistle* was heard. It was an appeal, by way of a special case, raising the question whether a coal mine is land within the meaning of the Lighting and Watching Act (3 & 4 Wm. IV., cap. 90). Mr. Poland, Q.C., and Mr. W. Graham appeared for the appellants; Mr. Castle, Q.C., and Mr. W. Mackenzie represented the respondents. Mr. Poland said his clients, Sir John Thursby and others, were colliery proprietors, and were rated on the net annual value of the mine, which was £2100. The rated premises, it was agreed, consisted entirely of underground mines 500 feet at least below the surface, and had no shaft or opening to the surface within the township of Briercliffe-cum-Entwistle. All these, as well as all houses, buildings, and the erections and property of a like nature used in connection with getting coal, were situate in Burnley, where they were assessed to the poor, sanitary, lighting, and other rates. The respondents made a lighting rate, and charged the appellants in respect of that portion of their property within the district, as if it were "a house, building, or property other than land." The appellants objected to this rate; and the question was whether a coal mine was land within the meaning of the statute, or whether it was "a house, building, or property other than land." If it was the latter, it must be rated at an amount three times greater than land. He submitted that the property within the respondents' district was land, and ought to be rated on the lower scale. Mr. Castle, in opposing the appeal, said the fact that the buildings and openings of the mine happened to be in another parish did not affect this question. He submitted that at present the law was that coal mines, saleable underwood, and sporting rights, all being property other than buildings, and some of which might include land, had to pay upon the full amount to the lighting rate. A coal mine could not be land under the statute of Elizabeth relating to rating. Justice Mathew said that, under the statute referred to, it was quite clear that coal mines were not land; and this being so, they came within the definition of "property other than land," and were therefore subject to the higher rate. The appeal would accordingly be dismissed, with costs. Leave to appeal was granted.

Drainage and Electric Lighting Schemes for Monmouth.—The Monmouth Town Council have had under consideration a somewhat voluminous correspondence from the Local Government Board. Powers to borrow £18,000 to carry out a combined system of drainage and electric lighting for the town had been applied for; and the Board directed the scheme to be altered, showing the cost under each head. In the revised estimates, £11,500 is calculated as the cost of the drainage and £7500 for electric lighting if carried out separately. The Board now declined to grant power for the loan for electric lighting pending the receipt of a Provisional Order, and expressed an opinion that the part of the scheme relative to using the water from the Wye as a motive power to drive two turbines was not practicable, owing to insufficient slope in the water-course and uncertainty of flow in the river. After a long debate, it was decided to call in the services of Messrs. Bramwell and Harris, to examine and report upon the feasibility or otherwise of using turbines; and should their decision be favourable to their use, the Local Government Board is to be again approached on the subject.

The Finances of the Liverpool Corporation Water Department.—At the meeting of the Liverpool City Council on the 7th inst., Alderman Hughes, in moving that the report and estimates of receipts and expenditure of the Water Committee for 1894 be approved, pointed out that, whereas they began the year with a balance in hand of £14,816, they left off with a balance of £22,158. Next August, however, the provision of a sinking fund for the Vyrnwy works would lay an obligation upon Liverpool and the district of providing nearly £15,000 out of the expenditure of the year. In spite of this, the Committee felt that the soundness of their position was such that they were justified in recommending that relief should be given in the matter of water charges both to the trade and shipping of the port. In regard to the shipping, the reduction meant an abatement of practically 25 per cent., or a concession of about £4000 a year; and in respect of the reduction to traders, the concession would practically mean a loss of revenue of something like £8000 a year, but the Committee were hopeful of obtaining a much increased consumption. The motion was adopted, as was also the estimate of expenditure on capital account for the year 1894, amounting to £151,800.

GAS AND WATER COMPANIES' STOCK AND SHARE LIST.

(For Stock Market Intelligence, see ante, p. 326.)

Issue.	Share	When ex-Dividend.	Dividend or Div. & Bonus.	NAME.	Paid per Share	Closing Prices.	Rise or Fall in Wk.	Yield upon investment.
£			p. c.	**GAS COMPANIES**				£ s. d.
590,000	10	13 Oct.	10½	Alliance & Dublin 10 p. c.	10	17½—18½	..	5 13 6
100,000	10	,,	7½	Do. 7 p. c.	10	12—13	..	5 15 5
300,000	100	2 Jan.	5	Australian (Sydney) 5 % Deb.	100	105—107	..	4 13 4
100,000	20	14 Dec.	8	Bahia, Limited	20	10½—11½	..	13 18 3
200,000	5	15 Nov.	6½	Bombay, Limited	5	4½—5	..	6 10 0
40,000	5	,,	6½	Do. New	4	3½—4	..	6 10 0
380,000	Stck.	16 Aug.	11½	Brentford Consolidated	100	220—225	..	5 2 2
180,000	,,	,,	8½	Do. New	100	163—168	..	5 1 2
220,000	Stck.	15 Sept	11½	Brighton & Hove Original	100	210- 220	..	5 6 11
888,500	Stck.	31 Aug.	5	Bristol	103	102—105	..	4 15 3
320,000	20	29 Sept.	11½	British	20	44 —46	..	4 17 10
50,000	10	31 Aug.	11½	Bromley, Ordinary 10 p. c.	10	23—22	..	5 4 7
51,510	10	,,	8½	Do. 7 p. c.	10	15½—16½	+½	5 3 0
328,750	10	28 July	2	Buenos Ayres (New) Limited	10	5½—6½	..	3 1 6
200,000	100	2 Jan.	6	Do. 6 p. c. Deb.	100	98—101	..	5 18 10
150,000	20	13 July	8	Cagliari, Limited	20	27—28	..	5 14 3
550,000	Stck.	13 Oct.	12½	Commercial, Old Stock	100	250—255	..	5 18 0
165,000	,,	,,	9½	Do. New do.	100	193—195	..	4 17 5
160,762	,,	14 Dec.	4½	Do. 4½ p. c. Deb. do.	100	128—133	+3	3 7 9
800,000	Stck.	14 Dec.	13	Continental Union, Limited	100	230—235	..	5 10 7
200,000	,,	,,	10	Do. 7 p. c. Pref	100	203—207	..	4 16 7
535,000	Stck.	15 Sept.	5	Crystal Palace Ord. 5 p.c. Stk	100	102—107	+2	4 13 5
486,090	10	31 Jan.	10	European, Limited	10	22—23	..	4 6 11
354,060	10	,,	10	Do. Partly paid	7½	15½—16½	..	5 10 11
5,646,590	Stck.	14 Feb.	12	Gaslight & Coke, A, Ordinary	100	223-233*	−1	5 3 0
100,000	,,	,,	4	Do. B, 4 p. c. max.	100	97-100*	..	4 0 0
665,000	,,	,,	10	Do. C, D, & E, 10 p.c. Pf.	100	273-278*	+3	3 12 0
30,000	,,	,,	5	Do. F, 5 p. c. Prf.	100	130-135*	+5	3 14 1
60,000	,,	,,	7½	Do. G, 7½ p. c. do.	100	190-195*	+3½	3 16 11
1,300,000	,,	,,	7	Do. H, 7 p. c. max	100	170-175*	..	4 0 0
463,000	,,	,,	10	Do. I, 10 p. c. Prf.	100	267-272*	+2	3 13 6
476,000	,,	,,	6	Do. K, 6 p. c. Prf.	100	163-168*	+½	3 11 5
1,061,150	,,	14 Dec.	4	Do. 4 p. c. Deb. Stk.	100	127+130	..	3 1 6
294,850	,,	,,	4½	Do. 4½ p. c. do.	100	130—135	..	3 6 8
908,000	,,	,,	6	Do. 6 p. c. do	100	175—180	..	3 6 8
3,800,000	Stck.	15 Nov.	12	Imperial Continental	100	210—215	+4½	5 11 7
75,000	5	14 Dec.	6	Malta & Mediterranean, Ltd.	5	4½—5	..	6 0 0
560,000	100	2 Oct.	5	Met. of Melbourne, 5p. c. Deb.	100	107—109	..	4 11 9
541,920	20	15 Nov.	5	Monte Video, Limited	20	124—13½	..	7 4 8
150,000	5	30 Nov.	8	Oriental, Limited	5	6—6½	..	6 3 1
60,000	5	29 Sept.	7	Ottoman, Limited	5	4—4½	..	7 15 6
166,870	10	31 Jan.	2	Pará Limited	10	1¾—2¼	..	8 17 9
				People's Gas of Chicago—				
420,000	100	2 Nov.	6	1st Mtg. Bds.	100	98—102	..	5 17 8
500,000	100	1 Dec.	6	2nd Do.	100	96—100	..	6 0 0
150,000	10	13 Oct.	5	San Paulo, Limited	10	8—9	¼	5 11 1
500,000	Stck.	31 Aug.	15½	South Metropolitan, A Stock	100	315—320	+2	4 16 10
1,350,000	,,	,,	12	Do. B do.	100	257—262	+2	4 11 7
260,000	,,	,,	13	Do. C do.	100	262—267	..	4 17 4
750,000	,,	17 Jan.	5	Do. 5 p. c. Deb. Stk.	100	150—153	..	3 5 4
60,000	Stck.	31 Aug.	11½	Tottenham & Edm'nton, "A"	100	210—215	..	5 7 0
				WATER COMPANIES.				
745,967	Stck.	29 Dec.	10	Chelsea, Ordinary	100	271—276	..	3 12 6
1,720,252	Stck.	13 Oct.	8	East London, Ordinary	100	218—223	..	3 11 9
544,440	,,	29 Dec.	4½	Do. 4½ p. c. Deb. Stk.	100	147—150	..	3 0 0
700,000	50	14 Dec.	8½	Grand Junction	50	116·-120	..	3 10 10
708,000	Stck.	16 Aug.	11½†	Kent	100	290—295	..	3 17 11
1,043,800	100	29 Dec.	9½	Lambeth, 10 p. c. max.	100	250—255	..	3 14 6
406,200	100	,,	7½	Do. 7½ p. c. max.	100	200—205	..	3 13 2
310,000	Stck.	29 Sept.	4	Do. 4 p. c. Deb. Stk.	100	128—131	..	3 1 0
500,000	100	14 Feb.	12½	New River, New Shares	100	370-375*	+2	3 4 8
1,000,000	Stck.	31 Jan.	4	Do. 4 p. c. Deb. Stk	100	132—135	..	2 19 3
902,300	Stck.	14 Dec.	6	S'thwk & V'xhall, 10 p. c. max.	100	160—165	+3	3 12 9
126,500	100	,,	6	Do. D 7½ p. c. do.	100	147—152	+2	3 19 0
1,155,066	Stck.	14 Dec.	10	West Middlesex	100	268—273	..	3 13 3

*Ex div.

† Next dividend will be at this rate

The Carlisle Gas and Water Works Benefit Society.—This Society was established in 1892 with 17 members, who paid 3d. or 4d. per week apiece according to their ages. The membership has gradually increased, and at the present time the number is 95. The Society has in the bank £376; and in the hands of the Treasurer (Mr. Osborne) £12; making the total funds £388. The benefits of the Society are 10s. per week for 13 weeks, 7s. 6d. for the next 13 weeks, 5s. for other 13 weeks, and 2s. 6d. for the remaining time of illness. In the case of the death of a member, his widow or legal representative receives £5; at the death of a member's wife, the member receives £3; and in the case of the death of a member's child under 14 years of age, £1. Last year the Society paid out the sum of £76 10s. 9d., including payments for one member's wife and six children. The annual *soirée* took place last week in the reading-room at the gas-works. Mr. Forster, the Chairman of the Gas Committee, presided, and congratulated the members on the success of the Society. Mr. Osborne presented a report of the Society's position, as set forth above. An excellent programme of music was gone through; and the evening was a very pleasant one.

The Opposition to the Torquay Corporation Water Bill.—A good deal of feeling is being imported into the water question at Torquay. A Committee of influential ratepayers who are opposed to the Corporation Bill met the Water Committee on the 2nd inst., and had a long and bitter discussion with them on the subject. The Ratepayers' Committee asked for further time to inquire into the proposals of the Corporation, and suggested the appointment of a Joint Committee of the Council and ratepayers to consider them. The decision of the Water Committee was that, if another deputation was appointed, the Council and the Committee would hear what they had to say; but they were not prepared to advise any delay in proceeding with the Bill. At the meeting of the Corporation on the following Thursday, the Water Committee reported the result of the interview; and after considerable discussion, with the view to a peaceful settlement of the matter, a resolution was passed in this form: "That the Water Committee would be willing to meet a Committee appointed by the burgesses to consider any scheme that is or may be devised to improve the condition of the water, to ensure the possibility of carrying out any scheme which the Bill, as applied for, covers." At the request of 20 burgesses, the Mayor convened another public meeting last Wednesday, at which a Committee of ratepayers was appointed to act with the Water Committee to try and settle the difficulty.

Water-Works Extensions at Colne.—An inquiry was held at Colne a short time ago, by Colonel Luard, R.E., one of the Inspectors of the Local Government Board, respecting an application made by the Local Board for permission to borrow £4000 for works of water supply. Since they acquired the undertaking in 1881, the Board have expended £65,000 in extensions, including £35,000 the cost of a new compensation reservoir. In the period mentioned, the population has increased from 12,000 to 18,500; and, in order to meet the needs of the consumers, the Board propose to draw on that reservoir. For this purpose they require filter-beds; and the proposed loan is to be laid out upon these works. Mr. A. Varley, the Clerk to the Board, placed these facts before the Inspector, and explained that the filter-beds would cover an area of 900 yards, that polarite would be the filtering medium, and that about half a million gallons a day would pass through the filters. At the close of the inquiry, Colonel Luard visited the site of the proposed works.

The Extension of the Leeds Corporation Water-Works.—At the meeting of the Water Committee of the Leeds Corporation last Friday week, the City Engineer (Mr. T. Hewson) informed the members that the time had arrived when steps should be taken for the extension of the third gravitating main from Swinsty to Arthington. He estimated the cost of laying eight or nine miles of 30-inch main at about £40,000. The work would, he believed, take 18 months to finish, though no doubt it could, if necessary, be completed in a year. The advantages of having such an additional main would be great. It would then be possible, with the aid of pumping at Arthington, to convey to Leeds a supply of 17 million gallons of water per day; the consumption at present being in round numbers 13 millions. A saving would, therefore, be effected by obviating the necessity of pumping at Arthington. It was hoped that before long the large reservoir at Eccup would be ready for re-filling. Under present conditions, this would take more than a year; but, if the new main were laid, it could be completed in a much shorter time—bearing in mind the power to pump 6 million gallons a day at Arthington. Mr. Hewson was requested to prepare specifications, and obtain tenders for the work before the next Committee meeting. A Sub-Committee was also appointed to report upon the state of the pumping-station at Headingley. This was built 28 years ago, and not only are the engines and boilers worked almost at their maximum, but they are in a dilapidated condition. Consideration will likewise be given to the increase of power desirable, to meet the demand for water in the high-level district.

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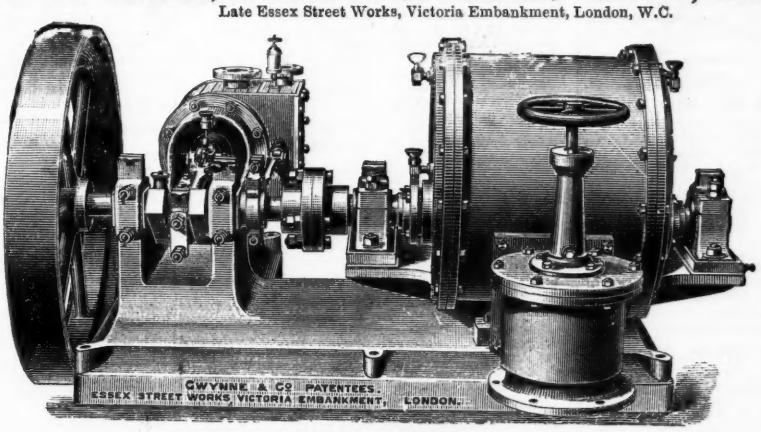

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*** See Advertisement, p. 319 of this week's issue

Cablegrams: "Ignitor London." Telegrams: "Holmes Huddersfield."

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JOHN NICHOLSON & SONS, Chemical Works, LEEDS, specially produce this ACID from BRIMSTONE, for making SULPHATE OF AMMONIA of high quality and *good* colour. Delivery in our own Railway Tank-Wagons or Carboys. Highest references and all particulars supplied on application.

MR. J. C. CHAPMAN, Fellow of the Chartered Institute of Patent Agents, advises on all matters connected with LETTERS PATENT FOR INVENTIONS and the PROTECTION OF TRADE MARKS, &c., at home and abroad. Preliminary Information and Handbook on application.
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SPECIAL PAINT FOR GAS-WORKS.

JOHN E. WILLIAMS AND CO.,
VICTORIA PAINT WORKS, MANCHESTER.
Telegrams: "ENAMEL." National Telephone 1759.
GAS PLANT CEMENT
FOR ALL LEAKAGES.

WANTED, a second-hand Tower SCRUBBER, about 4 or 5 feet diameter, in good condition.
Offers, with full particulars, to T. BROWN, Manager, Gas-Works, MATLOCK BRIDGE.

PURIFIERS.

FOR SALE—Four 5 feet Square PURIFIERS, in good condition, lying at Filey.
Apply to HENRY TOBEY, Gas-Works, MALTON.

FOR SALE—Double-acting Piston and Cylinder EXHAUSTER, attached to same bedplate. Very suitable for a small Gas-Works. A bargain.
Apply to the MANAGER, Gas-Works, BARRHEAD.

TWO Single-Lift Gasholders, about 100 feet diameter by 24 feet deep, one having Wrought-Iron Tank, FOR SALE. In good condition; the only reason for removing them being the enlargement of the Works and Plant generally.
Apply, by letter, to No. 2338, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

FOR SALE—The following second-hand GAS PLANT:—
Round STATION METER (6-inch Connections).
9-inch STATION GOVERNOR.
KORTING STEAM-JET EXHAUSTER. Capacity 5000 cubic feet per hour.
One 6-inch FOUR-WAY VALVE.
Two 6-inch RACK-VALVES.
One 8-inch RACK-VALVE.
LIFTING GEAR for Purifier Covers.
Apply to W. MURRAY, Manager, Gas-Works, Limited, UTTOXETER.

THATCHAM GAS-WORKS, BERKS.

TO BE SOLD OR LET.

For Removal or Occupation, including the Mains as laid, and the Yard suitable for Coal Trade, situated in the Station Road.

THE Works may be viewed on appli- cation, by letter, to the Manager (Mr. G. J. Fyfield); and, if satisfactory arrangements are effected, possession may be had on March 25, 1894.
Offers to be addressed to the Directors of the Company at Thatcham; but they will not bind themselves to accept the highest or any offer.
Dated Feb. 7, 1894.

TENDERS FOR TAR.

THE Directors of the Exeter Gaslight and Coke Company invite TENDERS for their surplus TAR for One Year from Lady-day next.
Delivery on Company's Works filled into Purchasers' Tanks.
Sealed tenders, endorsed "Tender for Tar," will be received by the undersigned on or before Tuesday, the 13th of March next; but the Directors do not bind themselves to accept the highest or any tender.
By order,
W. A. PADFIELD,
Secretary and Manager,
Gas Offices: 248, High Street, Exeter,
Feb. 9, 1894.

COUNTY BOROUGH OF BURNLEY.

TO GASHOLDER MAKERS.

THE Gas Committee of the Corporation of Burnley invite TENDERS for the TAKING OUT of an OLD GASHOLDER and the construction and erection of a NEW FIVE-LIFT GASHOLDER.
The Specification and Drawings may be seen, on and after the 9th of February, 1894, on application to the undersigned, from whom Bill of Quantities and Form of Tender may be obtained on deposit of One Guinea, which will be returned on receipt of a *bonâ fide* tender.
Tenders under seal, endorsed "Tender for Gasholder," to be addressed to the Chairman of the Gas Committee, and delivered at the Town Clerk's Office, Town Hall, Burnley, on or before Wednesday, the 28th of February, 1894.
JNO. P. LEATHER,
Gas Engineer.
Gas-Works, Burnley,
Jan. 31, 1894.

SADLER AND CO., LIMITED,
MIDDLESBROUGH; ULVERSTON (BARROW); PORTSMOUTH; CARLTON; STOCKTON; 315, St. Vincent Street, GLASGOW; and 85, Water Street, NEW YORK. Tar Distillers, Manufacturers of all TAR PRODUCTS, ALIZARINE and other TAR COLOURS, BICHROMES, OXALIC ACID, ALKALIES, LIQUOR AMMONIA, AMMONIA SULPHATE, &c.
Head Office: MIDDLESBROUGH. Correspondence invited.

PORTER & CO., Gowts Bridge Works,
LINCOLN, Engineers, Ironfounders, and Contractors, for the erection of Gas-Works for Towns, Villages, Mansions, Manufactories, Collieries, and Isolated Buildings, at home and abroad. Manufacturers of Retorts and Fittings, Condensers, Scrubbers, Purifiers, Valves, &c.; also of Girders, Wrought and Cast Iron Tanks, Iron Roofs, &c.
Telegraphic Address: "PORTER, LINCOLN."

DRAWINGS, Tracings, Specifications, Quantities, Strains, &c., prepared by an experienced Gas-Engineering Draughtsman. Plans of Works made, copied, or enlarged. Illuminated Addresses in first-class style. Writings of all kinds, Engrossments, &c.
Address J. H. OPPENHEIM, 27, FORE STREET, E.C.

BOROUGH OF EAST RETFORD.

TO GASHOLDER MAKERS.

THE Gas Committee of the above Cor- poration invite TENDERS for the REMOVAL of an old SINGLE-LIFT GASHOLDER, and the CONSTRUCTION and ERECTION of a new TWO-LIFT GASHOLDER.
Plans and Specification may be seen on application to the undersigned.
Sealed tenders are to be sent in, addressed to the Chairman of the Gas Committee, and endorsed "Tender for Gasholder," on or before the 3rd of March, 1894.
The Committee do not bind themselves to accept the lowest or any tender.
J. B. FENWICK,
Engineer and Manager.
Gas and Water Offices, East Retford,
Feb. 16, 1894.

SLIGO GASLIGHT AND COKE COMPANY.

TO GASHOLDER MAKER.

THE Directors are prepared to receive TENDERS for TELESCOPING a 50 ft. by 18 ft. GASHOLDER with TWO ADDITIONAL LIFTS.
Tenders, accompanied by Drawings, showing method of construction proposed, and Specification, to be delivered on or before the 20th of March.
Any further details may be obtained from the undersigned.
The Directors do not bind themselves to accept the lowest or any tender.
C. B. TULLY,
Engineer and Secretary.
Gas-Works, Sligo,
Feb. 14, 1894.

BOROUGH OF MACCLESFIELD.

THE Gas Committee are prepared to receive TENDERS for the purchase of the surplus TAR and AMMONIACAL LIQUOR made at their Works during the Twelve Months or Two Years commencing the 1st day of May next.
Tenders, for both one or two years, and for the Tar or Liquor separately, to be sent in not later than Saturday, the 10th of March, 1894, addressed to the Chairman of the Gas Committee, Town Hall, Macclesfield, and endorsed "Tender for Tar, &c."
For conditions apply to Mr. Newbigging, Engineer, Gas-Works, Macclesfield.
The Committee reserve to themselves the right of accepting any tender for the Tar or Liquor separately.
The highest or any tender not necessarily accepted.
W. FREDK. TAYLOR,
Town Clerk.
Feb. 12, 1894.

BOROUGH OF RICHMOND SURREY.

WATER-WORKS AND PUBLIC BATHS.
TENDERS FOR WELSH COAL.

THE Town Council for the Borough of Richmond, Surrey, invite TENDERS for the supply of about 1500 tons of best WELSH SMOKELESS STEAM COAL, to be delivered, in Barges of about 40 tons, alongside the Wharf, opposite the Water-Works, Richmond, for One Year, from March 25, 1894.
The Seam and District from which the Coal is to be supplied must be stated on the tender.
Particulars and Forms of Tender can be obtained of Mr. W. G. Peirce, Engineer at the Water-Works. No tender will be recognized unless it is made on the prescribed form, properly filled up in every respect; and no expenses or claim will be allowed or paid to any person whether tendering or not.
The security stipulated by the Public Health Act, 1875, for the due performance of the Contract, will be required. The Contract and Bond will be prepared by the Town Clerk.
Sealed tenders, endorsed "Tender for Welsh Coal," and addressed to the Chairman of the Water-Supply Committee, Borough of Richmond, Surrey, must be delivered at the Town Clerk's Office by Ten o'clock on Tuesday, the 6th day of March, 1894.
The Council do not bind themselves to accept the lowest or any tender.
FREDK. B. SENIOR,
Town Clerk.
Town Clerk's Office,
Town Hall, Richmond, Surrey.
Feb. 13, 1894.

CORPORATION OF SOUTHPORT.

THE Gas Committee invite Tenders for Twelve Months for the following:—
SULPHURIC ACID,
JOBBING CASTINGS.

Specifications may be had on application to the undersigned, to whom endorsed tenders must be sent not later than March 12 next.

JOHN BOOTH,
Engineer.

Gas-Works, Southport.

BRADFORD CORPORATION WATER-WORKS.
NIDD VALLEY SUPPLY.
CONTRACT NO. 4.

TO STEEL PIPE MAKERS.

THE Bradford Corporation invite TENDERS for the supply of 1800 tons or thereabouts of MILD STEEL PIPES, 36 inches diameter.

Copy of Specification, Schedule of Quantities, and Drawings may be obtained on application to Mr. James Watson, M.Inst.C.E., Water-Works Engineer, Town Hall, Bradford, upon payment of Two Guineas, which will be returned on receipt of a *bonâ fide* tender.

Sealed tenders, marked "Tender for Mild Steel Pipes," must be addressed to the Town Clerk, Town Hall, Bradford, and be delivered on or before the 1st of March next.

The Contractor must give an assurance to the Corporation that he pays to the workmen employed by him not less than the minimum standard rate of wages.

The Corporation do not bind themselves to accept the lowest or any tender.

By order,
W. T. M'GOWEN,
Town Clerk.

Town Hall, Bradford,
Feb. 9, 1894.

MANCHESTER CORPORATION GAS-WORKS.

TO TAR DISTILLERS AND OTHERS.

THE Gas Committee of the Corporation of Manchester are prepared to receive TENDERS for the purchase and removal of the GAS TAR to be produced at their several Stations during a period of One, Two, or Three Years, commencing as follows, viz.:—

Bradford Road Station, from noon on the 31st of March, 1894.
Rochdale Road Station, from noon on the 24th of June, 1894.
Gaythorn Station, from noon on the 1st of August, 1894.

The Committee do not bind themselves to accept the highest or any tender, and reserve the right to divide the tenders as they may consider advisable.

Sealed tenders, addressed to the Chairman of the Gas Committee, and endorsed "Tender for Tar," must be delivered at the Offices of the Gas Department, Town Hall, on or before Thursday, the 1st of March next.

Forms of Tender and other Particulars may be obtained on application in writing to Mr. Charles Nickson, Superintendent of the Department.

By order of the Gas Committee,
WM. HENRY TALBOT,
Town Clerk.

Town Hall, Manchester,
Feb. 2, 1894.

RIDDINGS DISTRICT GAS COMPANY.

NOTICE is hereby given, that the ORDINARY HALF-YEARLY MEETING of the Shareholders of the above Company will be held at the Offices of the Company, No. 30, Gracechurch Street, in the City of London, on Tuesday, the 6th day of March, 1894, at Two o'clock in the afternoon precisely, to receive the Report of the Directors and the Accounts for the Half Year ending the 31st day of December last to declare a Dividend, to elect Directors and an Auditor in the place of those retiring by rotation, and to transact the General Business of the Company.

The Transfer Books will be closed from the 21st of February to the 6th of March, both inclusive.

By order of the Board,
ALFRED LASS,
Secretary.

Offices: 30, Gracechurch Street, London,
Feb. 15, 1894.

TOTTENHAM AND EDMONTON GASLIGHT AND COKE COMPANY.

NOTICE is Hereby Given, that the HALF-YEARLY ORDINARY GENERAL MEETING of the Proprietors in this Company will be held at the Company's Offices, Willoughby Lane, Tottenham, on Saturday, the 24th day of February inst., at half-past three o'clock in the afternoon precisely, to receive the Report of the Directors, the Statement of Accounts for the Half Year ended the 31st day of December, 1893, to declare a Dividend, and transact such other Business as the Act of Parliament directs.

The Transfer Books will be closed from Saturday, the 10th, until Monday, the 26th inst.

By order of the Board,
JAMES RANDALL,
Secretary.

Offices of the Company: Willoughby Lane,
Tottenham, Feb. 9, 1894.

BROMLEY GAS CONSUMERS' COMPANY.

NOTICE is Hereby Given, that the ORDINARY HALF-YEARLY GENERAL MEETING of this Company will be held at the Bell Hotel, Bromley, Kent, on Monday, the 26th day of February inst., at 5.45 p.m., precisely, to receive the Report of the Directors, the Balance Sheet confirmed by the Auditors, to declare Dividends, and for General Business.

The Transfer Books will be closed from the 12th to the 26th of February, 1894, both days inclusive.

By order of the Board,
HENRY W. AMOS,
Secretary.

Offices at the Works, Bromley, Kent.
Feb. 10, 1894.

HOLMSIDE GAS COALS.

(Wrought out of Holmside and South Moor Collieries.)

PRESENT production 4000 tons per working day. Area of coal about 5000 acres, including the largest remaining workable proportion of pure HUTTON SEAM GAS COAL. Analysis of HOLMSIDE GAS COAL *in bulk as shipped* gives 10,500 cubic feet of Gas per ton, of an Illuminating Power of 16½ candles. The Sulphur is about 1 per cent., and the Ash 1¾ per cent. The Coal cokes well, and leaves about 70 per cent. of excellent Coke. To show the progress of HOLMSIDE COALS, it may be mentioned that the quantity carbonized by the London Gas Companies in 1885 was about 200,000 tons; whereas the present consumption of HOLMSIDE COALS in London alone is at the rate of nearly

600,000 Tons per Annum.

Full particulars on application to

MR. MARK ARCHER,
HOLMSIDE AND SOUTH MOOR OFFICES,
NEWCASTLE-ON-TYNE.

JAMES OAKES & Co.,

ALFRETON IRON-WORKS, DERBYSHIRE,

AND

Wenlock Iron Wharf, 21 & 22, Wharf Road, CITY ROAD, LONDON, N.,

Manufacture and keep in Stock at their Works (also large stock in London)

PIPES and CONNECTIONS, 1½ to 48 inches in diameter, and make and erect to order RETORTS, PURIFIERS and TANKS, with or without planed joints, COLUMNS, GIRDERS, SPECIAL CASTINGS, &c., required by Gas, Water, Railway, Telegraph, Chemical, Colliery, and other Companies.

NOTE.—Makers of HORSLEY'S PATENT SYPHONS. These are cast in one piece, without Chaplets; doing away with bolts, nuts and covers, and rendering leakage impossible.

LONDONDERRY GAS COALS

FROM THE

MARQUIS OF LONDONDERRY'S COLLIERIES,

COUNTY OF DURHAM.

Available output up to 5000 tons per day.
Yield of Gas 11,000 cubic feet per ton of Coal as per analysis by Mr. John Pattinson, F.C.S., F.I.S.

FOR PRICES AND PARTICULARS, APPLY TO

S. J. DITCHFIELD,
SEAHAM HARBOUR, COUNTY OF DURHAM.

BOLDON GAS COALS.

Worked by THE HARTON COAL CO., LTD.

Output about 3000 tons per day.

ANALYSIS—

Yield of Gas per ton	10,500	Cubic Feet.
Illuminating Power	16·9	Candles.
Coke	66·7	Coke.
Sulphur	0·86	Sulphur.
Ash	2·04	Ash.

Boldon Gas Coals are supplied under contract to

The Gaslight and Coke Company, South Metropolitan Gas Company, Commercial Gas Company, Imperial Continental Gas Association, European Gas Company, L'Union des Gaz (the Continental Union Gas Company), Ipswich Gaslight Company, Devonport Gas Company, Newcastle Gas Company, Sunderland Gas Company, South Shields Gas Company, and to many other Companies at Home and Abroad.

For prices, &c., apply to the

HARTON COAL COMPANY,

LIMITED,
Newcastle-on-Tyne.
W. H. PARKINSON,
FITTER.

Awarded HIGHEST MEDAL and DIPLOMA at the Newcastle-on-Tyne Royal Mining and Industrial Exhibition, 1887,

for

CANNEL & COAL.

TYNE

BOGHEAD CANNEL.

Yield of Gas per ton	13,155 cub. ft.
Illuminating Power	38·22 candles.
Coke per ton	1,301·88 lbs.

EAST PONTOP GAS COAL.

Yield of Gas per ton	10,500 cub. ft.
Illuminating Power	16·3 candles.
Coke	70 per cent.

SOUTH PELAW MAIN GAS COAL.

Yield of Gas per ton	10,500 cub. ft.
Illuminating Power	16·3 candles.
Coke	73·1 per cent.

For Prices and complete Analysis, apply to

THOS. W. DANCE & SONS,
COAL OWNERS, NEWCASTLE-ON-TYNE;
OR
E. FOSTER & CO.,
21, JOHN STREET, ADELPHI, LONDON, W.C.

ELEVENTH YEAR. Now Ready (Demy 8vo., Price 5s. 6d., post free),

THE COMPLETE REPORTS OF THE PROCEEDINGS

OF THE VARIOUS

DISTRICT ASSOCIATIONS of GAS MANAGERS FOR 1893.

***** THE TEN PREVIOUS VOLUMES (for 1883 to 1892) ARE STILL ON SALE.**

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TROTTER, HAINES, & CORBETT,

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FIRE-CLAY & BRICK WORKS,

STOURBRIDGE.

Manufacturers of GAS-RETORTS, GLASSHOUSE FURNACE & BLAST-FURNACE BRICKS, LUMPS, TILES, and every description of FIRE-BRICKS.

Proprietors of

BEST GLASSHOUSE POT & CRUCIBLE CLAY.

SHIPMENTS PROMPTLY AND CAREFULLY EXECUTED.

THORNLEY GAS COALS

WORKED BY THE

WEARDALE IRON AND COAL COMPANY, Ld.

OUT OF THEIR

THORNLEY AND WHEATLEY HILL COLLIERIES.

The Analysis made by Messrs. J. and H. T. Pattinson, Public Analysts for Northumberland, gives 10,500 cubic feet of Gas per ton, with an Illuminating Power of 16·3 Candles and 67·3 per cent. of Coke. The following is a Working Analysis made of these Coals by the Tudhoe and Sunderland Bridge Gas Company:—

[COPY.]

TUDHOE AND SUNDERLAND BRIDGE GAS COMPANY.

Tudhoe Gas-Works,
Spennymoor,
8th June, 1893.

Messrs. The

WEARDALE IRON & COAL COMPANY, LTD.

GENTLEMEN,

For the last two months we have used your **THORNLEY GAS COAL** exclusively at these gas-works; and I have pleasure in herewith giving you the actual results obtained during the trial.

Yield of Gas per ton: 10,300 cubic feet.
Yield of Coke: 13¼ cwt.

Illuminating Power of Gas, average of a series of tests, **17 Sperm Candles.**

The Coke was of excellent quality.

The following is a complete ultimate Analysis of the Coal.

	Per Cent.
Carbon	83·128
Hydrogen	5·116
Oxygen	7·401
Nitrogen	0·585
Sulphur	0·620
Ash	3·130
Water	0·020
	100·000

Analysis of the Coke.

Carbon	93·31
Sulphur	0·61
Ash	5·00
Moisture	1·08
	100·00

I am, Gentlemen,
Yours truly,
A. B. COWAN,
Manager.

For Price, &c., apply to the

WEARDALE IRON & COAL Co., Ld

QUAYSIDE, NEWCASTLE-ON-TYNE.

ROBERT MARSHALL,

CANNEL COAL MERCHANT,

97, WELLINGTON STREET, GLASGOW.

Prices and Analysis of all the Scotch Cannels on application.

CAST-IRON PIPES

FOR GAS AND WATER.

Pipes, One to Six inch Bore, kept in Stock. Also a very large assortment of all sizes of Bends, T-pieces, and Specials ready for despatch on receipt of Order.

VALVES

FOR GAS, WATER, AND STEAM.

TELEGRAMS: "PIPES GLASGOW."

WM. MACLEOD & CO.,

56, ROBERTSON STREET, GLASGOW.

THOMAS TURTON AND SONS, LIMITED,

SHEAF WORKS, SHEFFIELD,

MANUFACTURERS OF

FILES OF BEST QUALITY

FOR ENGINEERS.

STEEL OF ALL DESCRIPTIONS

SCREW STOCKS, TAPS AND DIES,

SPANNERS, RATCHET BRACES, LIFTING JACKS, ANVILS, VICES,

AND ENGINEERS' TOOLS GENERALLY.

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T. B. KITTEL, SHEFFIELD.

CONTRACTS FOR SUPPLIES OF ANY OF THE PRINCIPAL

ENGLISH & SCOTCH CANNELS.

REAL SILKSTONE GAS COAL

ANALYSIS AND PRICES ON APPLICATION.

T. B. KITTEL, SHEFFIELD.

PRICE'S PATENT COKE & COAL BARROW

effecting a great saving of time labour, and expense.

For particulars, price, &c., apply to Mr. E. PRICE, Inventor and Patentee, 22, Alwyne Road, Canonbury, LONDON, N.

Prices are Reduced.

UNEQUALLED.

Gas Companies are solicited to try Samples of the

MIRFIELD

BLACK BED GAS COAL.

Prices and Analysis on application.

MIRFIELD (GAS-COAL) COLLIERY COMPY.

RAVENSTHORPE, NEAR DEWSBURY.

JAMES WHITE & CO., LTD.,

WIDNES, LANCASHIRE,

Manufacturers of Special

FIRE-BRICKS, FIRE-CLAY, & FURNACE CEMENT.

FOR GAS FURNACES our GANNISTER and SILICA FIRE-BRICKS are acknowledged to be the best and most durable in the Market.

GANNISTER and SILICA FIRE-CLAY guaranteed of the Purest Quality.

FURNACE CEMENT specially made for repairing Furnaces and stopping Cracks.

ANALYSIS AND REFERENCES ON APPLICATION.

THE SILICA FIRE-BRICK COMPANY,

OUGHTIBRIDGE, near SHEFFIELD

MANUFACTURE

SILICA BLOCKS, BRICKS, AND CEMENT

OF SUPERIOR QUALITY

FOR GAS-FURNACES.

Trade Mark: "SILICA."

These Goods (largely used in Gas, Glass, Iron, and Steel Works) are, on account of their

GREATER DURABILITY

Strongly recommended where EXCESSIVE HEATS have to be maintained.

IMPORTANT TO ENGINEERS AND GAS COMPANIES.

A NEW CARBURETTOR FOR ENRICHING GAS IN BULK.

The Carburettors have been doing practical work for the past two years; in many cases doing all the enrichment without the use of Cannel or other rich Coals. The South Metropolitan Gas Company have these Enrichers at all their Stations. The Gaslight and Coke Company have had them in use at some of their principal Works for two years past; and several more are now being fixed at their other Stations. The Carburettors are also in use at several Suburban and Provincial Gas Companies' Works.

FOR PRICES AND FULL PARTICULARS, APPLY TO

THE GAS LIGHTING IMPROVEMENT COMPANY, LIMITED,

18, DEVONSHIRE STREET, BISHOPSGATE, LONDON.

NEWBATTLE CANNEL.

Highest Results in Gas, & Excellent Coke.

QUOTATIONS ON APPLICATION TO

THE LOTHIAN COAL COMPANY,

LIMITED,

NEWBATTLE COLLIERIES,

DALKEITH, N.B.

HEBBURN MAIN GAS COALS.

Yield of Gas per ton . . . . . 10,500 cubic feet.
Illuminating Power . . . . . 16·4 candles.
Coke . . . . . 68 per cent.

For prices, f.o.b. Ship or Delivered by Rail, apply to

THE WALLSEND & HEBBURN COAL COMPANY, LTD.

8 Lombard Street,
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W. RICHARDSON, Fitter.

HUNTER'S

OXIDE OF IRON.

JAMES HUNTER, LESSEE, MINER, AND SHIPPER OF NATURAL IRISH BOG ORE.

This Estate yields the finest and most uniform quality in Ireland; and the quality is guaranteed.

Samples and Prices on application.

11, BAY STREET, PORT GLASGOW.

Telegrams: "HUNTER PORT GLASGOW."

Established 1872.

G. WALLER & CO.'S NEW PATENT GAS EXHAUSTER

MADE WITH FOUR BLADES,

To pass 300,000 Cubic Feet per Hour, with or without Engine combined.

IN USE AND ON ORDER FOR OVER 100 WORKS,

AND EQUAL TO

5,340,000 CUBIC FEET PER HOUR.

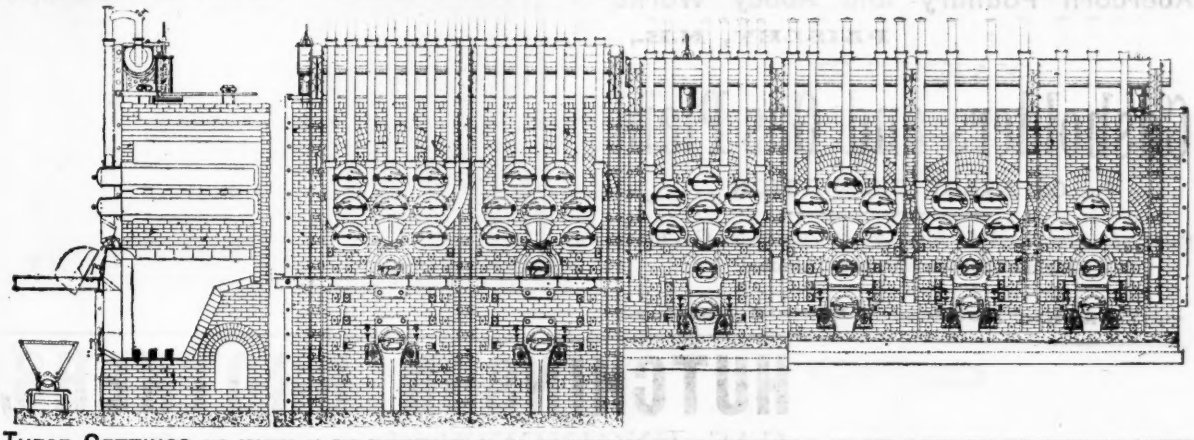
SPECIAL ADVANTAGES:—

The Four-Blade Exhauster **PASSES 50 PER CENT. MORE PER REVOLUTION** than any One or Two Blade Exhauster.
It takes 27 per cent. less power than any Two-Blade Exhauster.
It gives a **STEADIER GAUGE** than any other Exhauster.
One of our 150,000 feet per hour Patent Four-Blade Exhausters passes continuously **180,000** cubic feet per hour, driven by a **12-INCH STEAM CYLINDER.** No other Maker can give a similar result.
Model of Patent Exhauster sent for inspection.
Oldest Makers of **BEALE EXHAUSTERS** for over 300 Works.
Patent Compensating Steam Governor, Special Tar and Liquor Pumps, Gas-Valves.
Washer-Scrubbers, with **WOOD CLUSTERS,** and Tar Extractor combined.

PHŒNIX ENGINEERING WORKS,

PARK STREET, SOUTHWARK, LONDON, S.E.

HISLOP'S PATENT REGENERATIVE SETTINGS OF GAS-RETORTS.



THESE SETTINGS ARE ADAPTED TO THE REQUIREMENTS OF ALL GAS COMPANIES AND GAS CORPORATIONS AND HAVE ALREADY BEEN VERY EXTENSIVELY ADOPTED THEY ARE ERECTED UPON BOTH THE WORKING-STAGE AND SHALLOW-CHAMBER SYSTEMS, AND EQUALLY SATISFACTORY RESULTS ARE GUARANTEED IN BOTH CASES.

THE SETTINGS HAVE ATTAINED TO A MEASURE OF SUCCESS AND POPULARITY QUITE UNEQUALLED BY THAT OF ANY OTHER WITHIN THE SAME SPACE OF TIME. THE WORKING RESULTS OBTAINED, AND THE GENERAL SATISFACTION GIVEN, ARE DECLARED IN EVERY CASE TO EXCEED, AND IN MOST CASES CONSIDERABLY EXCEED, THE PATENTEE'S GUARANTEE. THE CONSTRUCTION AND WORKING OF THE PATENT PRODUCER AND THE PATENT CHARGING APPARATUS FOR SAME ARE ABSOLUTELY UNIQUE AND UNRIVALLED, AND ARE THE DELIGHT OF EVERY STOKER; WHILE IN EVERY OTHER PARTICULAR THEY SECURE THE HIGHEST RESULTS ATTAINABLE BY ANY REGENERATIVE SYSTEM, AND AT A MINIMUM OF COST.

Drawings and Specifications are furnished for the complete erection of Ovens, with or without Retort and Bench Mountings, or complete erection undertaken if required, and carried out by specially Trained Workmen.

Further particulars may be obtained on application to the Patentee's Agents: C. M. HAMILTON, 5, Stuart Street, Shawlands, Glasgow; J. E. FISHER, Stourbridge; JOHN WALSH & SONS, Retort Builders, Halifax, Yorkshire; RICHARD TURNER, Retort Builder, Denton, Lancashire; and from the Principal Agent, R. F. HISLOP (son of Patentee), Gas-Works, Paisley, N.B.

HISLOP'S PATENT HYDRAULIC MAIN SEAL-REGULATING AND TAR-EXTRACTING VALVE is a *Sine quâ non* TO THE SATISFACTORY WORKING OF THE HYDRAULIC MAIN UNDER THE REGENERATIVE AS WELL AS OTHER SYSTEMS OF RETORTS. BEING LARGELY ADOPTED, AND AFFORDING THE HIGHEST SATISFACTION.

SPENT LIMES NO LONGER WASTE PRODUCTS

Under G. R. HISLOP'S Patents, all Spent Limes are most effectually, economically, and continuously recovered at from one-third to one-half the cost of New Lime. The results are a surprise to all who have inspected the process, and are entirely satisfactory to all now using it.

Descriptive Pamphlets and Terms from Agents as above.

GAS AND WATER PIPES.

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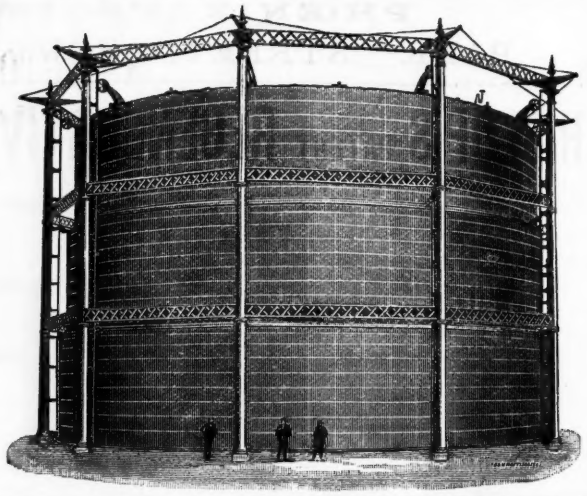

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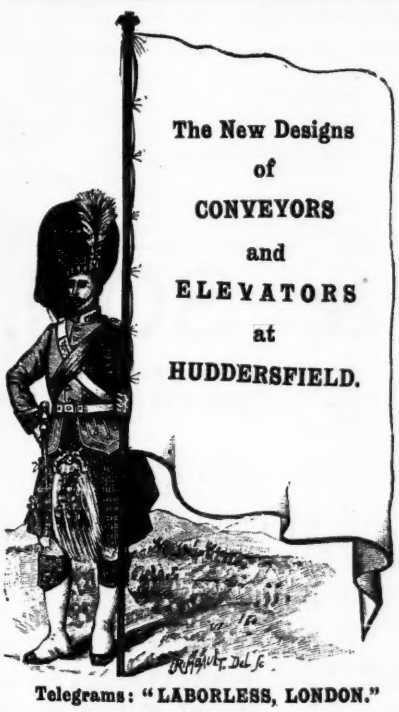

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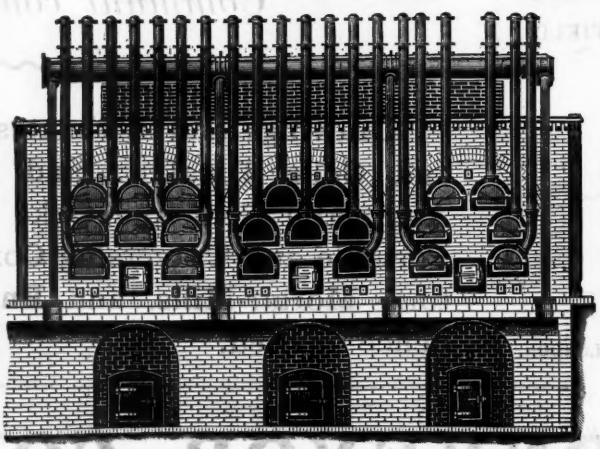

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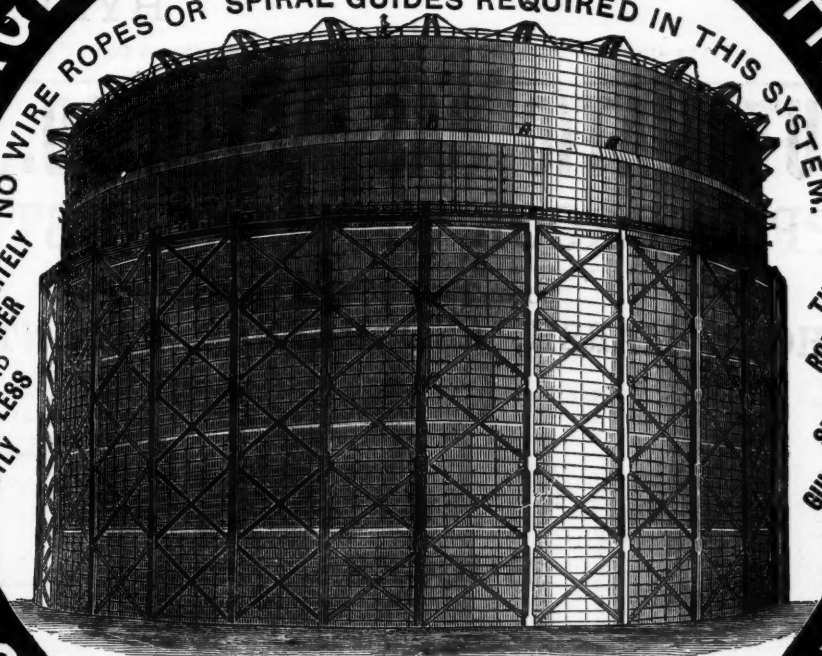
NO WIRE ROPES OR SPIRAL GUIDES REQUIRED IN THIS SYSTEM.



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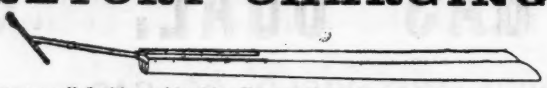

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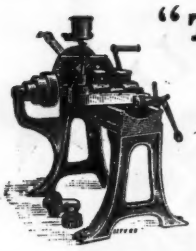

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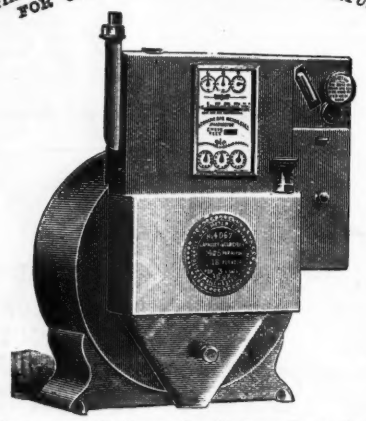
THE AMOUNT OF GAS GIVEN IN EXCHANGE FOR COIN CAN BE ALTERED *IN SITU.*



The persistent efforts of the Inventors of our Meters have been crowned with

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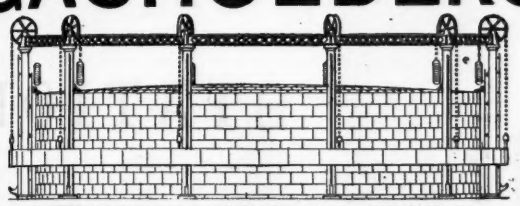

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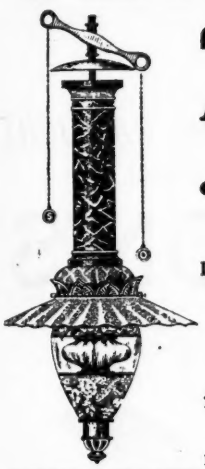

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CLASS A— 55/-
LIGHT for LIGHT
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RETORTS AND FIRE-BRICKS.
BEST QUALITY.
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[See Illustrated Advertisement, Feb. 6, p. 261.]

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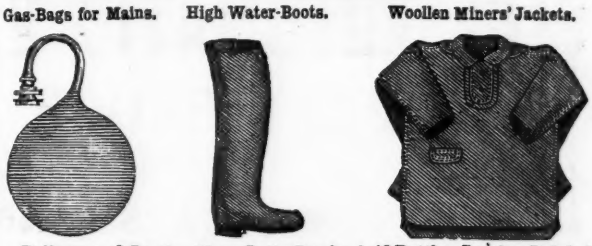

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OF ALL FORMS AND SHAPES
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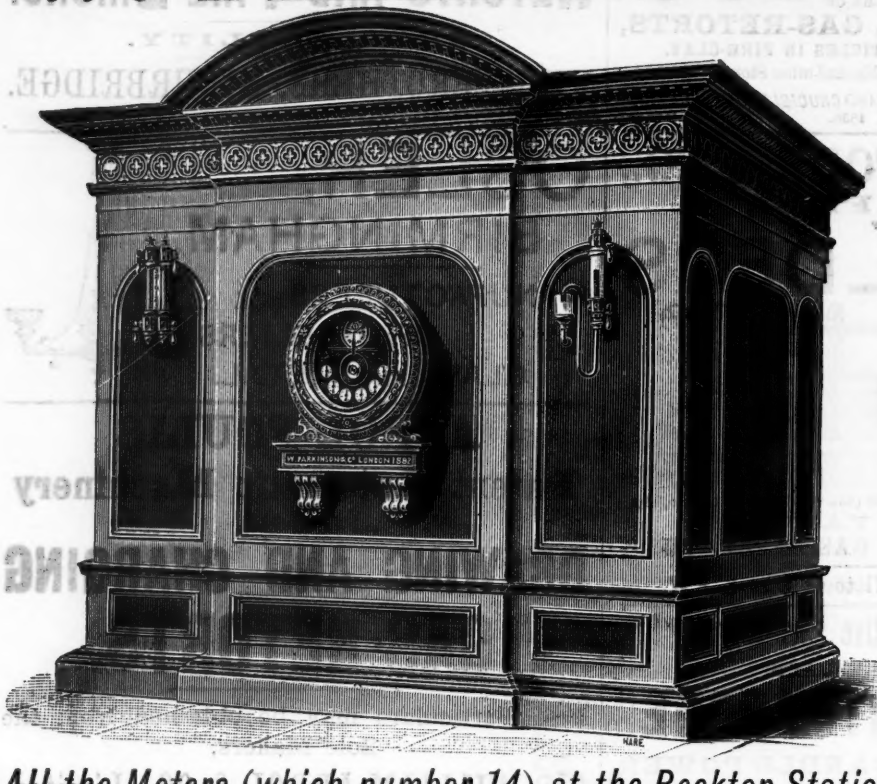

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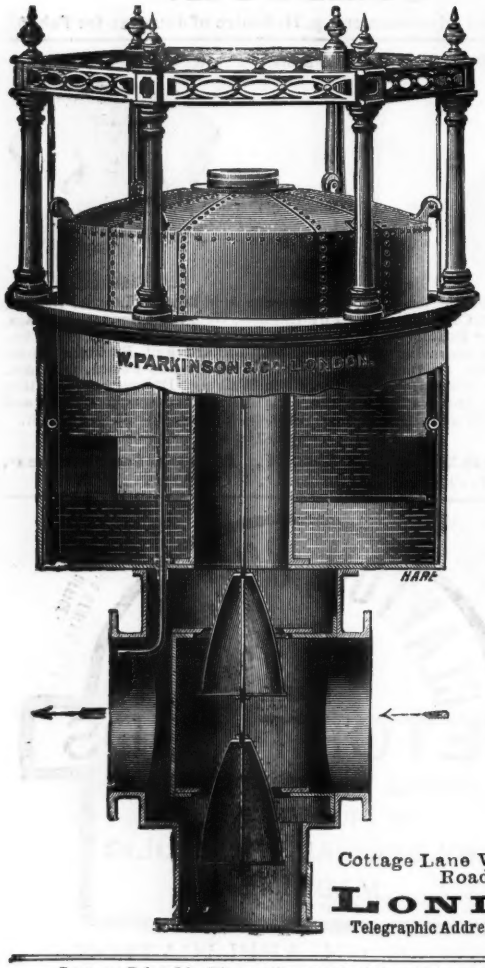
All the Meters (which number 14) at the Beckton Station of THE GASLIGHT AND COKE COMPANY have been erected by the above Firm.



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[See also Advt. p. 322.

LONDON: Printed by WALTER KING (at the Office of King, Sell, and Railton, Ltd. 12, Gough Square;) and published by him at 11, Bolt Court, Fleet Street, in the City of London.—Tuesday, Feb. 20, 1894.